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Archaeology of the North Yaquina Head Shell Middens, Central Oregon Coast

Rick Minor

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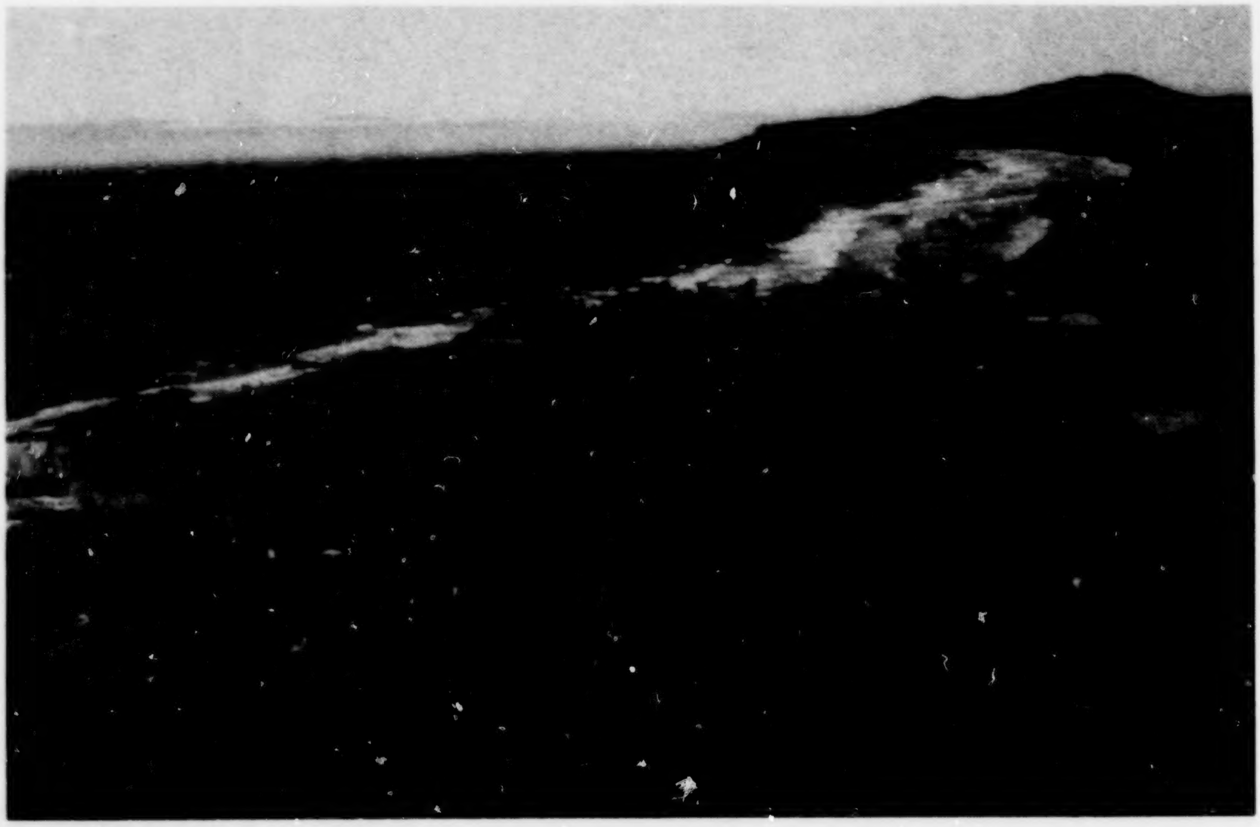

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ARCHAEOLOGY OF THE NORTH YAQUINA HEAD SHELL MIDDENS, CENTRAL OREGON COAST

by

Rick Minor

with contributions by

Debra C. Barner
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Report to

Bureau of Land Management
Salem District

Heritage Research Associates, Inc.
1997 Garden Avenue
Eugene, Oregon 97403

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FOREWARD

This report presents the findings of the second phase of archaeological investigations at Yaquina Head funded by the Salem District of the Bureau of Land Management. In contrast to the first phase of fieldwork (published as the first volume of this series), the second phase focused on a site located a short distance inland from the primary headland site. Originally tested and evaluated by Oregon State University in 1980, the site has been the focus of further field investigations due to a proposed boundary fencing project. The portion of this site located on public lands should be safely protected from further disturbance due to its distance from the intensive headland recreational activities.

Richard C. Hanes
Series Editor

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ABSTRACT

Archaeological investigations were sponsored by the Bureau of Land Management in 1988 at 35LNC50, a prehistoric shell midden on the north slope of Yaquina Head on the central Oregon coast. This archaeological site is situated along the northern boundary of the Yaquina Head Outstanding Natural Area administered by the Bureau of Land Management. Proposed construction of a fence along this property boundary prompted archaeological investigations to be conducted in order to recover information about prehistoric occupation that might be otherwise lost or disturbed by this project. The results of the 1988 investigations at 35LNC50 were combined with information obtained from previous test excavations at this site and nearby 35LNC49 by Oregon State University to provide a reconstruction of the activities carried out by prehistoric peoples at these two shell middens.

Two cultural components were defined at 35LNC50. The earlier component is represented by cultural materials recovered from below the shell midden. Evidence of this occupation is sparse, but includes vertebrate faunal remains of sea otter and an unidentified pinniped, indicating some hunting of sea mammals. A single radiocarbon date of 1390 BP was obtained from this earlier component. The later component at 35LNC50 is represented by cultural materials recovered from the shell midden deposit. Sea mussels comprise over 90% of the midden (by weight). Vertebrate faunal remains include a variety of terrestrial and marine mammals, birds, and fish. Six radiocarbon dates ranging from 1160 BP to 550 BP are available from the shell-bearing strata at 35LNC50. No radiocarbon dates are available from 35LNC49, but this site is tentatively assumed to have been occupied during roughly the same timespan on the basis of the single temporally-diagnostic projectile point recovered.

The timespan during which 35LNC49 and 35LNC50 were occupied is well within the period that Penutian-speaking peoples are thought to have inhabited the Oregon coast, and it is likely that these two shell middens were occupied by the ancestors of the Yaquina Indians. Analysis of the cultural remains suggests that the shell middens on the north side of Yaquina Head were occupied by task-specific groups ranging out from villages primarily during the period from late winter to early spring. These small groups were presumably in search of resources to either replenish depleted winter stores or to provide some much-needed variety to the diet of stored foods relied upon during the winter months.

PREFACE AND ACKNOWLEDGMENTS

Archaeological research at the North Yaquina Head shell middens involved investigations at two sites: 35LNC50 and 35LNC49. The investigations at 35LNC50 were carried out under the terms of Contract No. OR080-PH8-167 between the Bureau of Land Management, Salem District, and Heritage Research Associates, Inc. of Eugene, Oregon. Frances M. Philipek served as the BLM Contracting Officer's Representative, while Rick Minor was the Principal Investigator for Heritage Research Associates (HRA).

Archaeological fieldwork at 35LNC50 was conducted under the direction of Rick Minor between July 18-23, 1988. HRA field archaeologists employed on this project included Paul W. Baxter, Robert R. Musil, and Kathryn Anne Toepel. William Strong, of the Confederated Tribes of Siletz Indians, and BLM volunteers Peter Edwards, Dave Hayes, Kim Kluck, Rob Jenkins, Brant Fisher, and Erica Hanson also participated in the excavations. Mary Viles of the Siletz Tribe was in charge of public relations during the project. Julie Thiel, BLM botanist, identified the flora on the site.

Test excavations had been previously conducted at 35LNC50 and 35LNC49 in 1980 by Oregon State University. Permission to analyze and report the results of this earlier fieldwork was granted by Richard E. Ross. Loan of the collection to HRA for laboratory preparation, analysis, and reporting was arranged through Roberta L. Hall of Oregon State University.

This volume represents the combined efforts of a number of investigators. Rick Minor served as volume editor and was responsible for synthesizing the results of the various specialized analyses. Description of the geomorphology and soils at the sites was undertaken by Patricia F. McDowell. Molluscan remains were identified and analyzed by Debra C. Barner. Ruth L. Greenspan analyzed the fish and mammal bones, while bird bones were identified by Rebecca J. Wigen. All of these investigators contributed information presented in the interpretive section (Chapter 7) of this volume.

Final responsibility for production of this report was assumed by Kathryn Anne Toepel. Artifact illustrations, maps, and stratigraphic profiles were prepared by Jill A. Chappel. The field notes, artifacts, and faunal collections resulting from HRA's investigations were deposited for curation at the Oregon State Museum of Anthropology, University of Oregon, under Accession No. 675 (35LNC50) and 676 (35LNC49).

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CHAPTER 1

INTRODUCTION

Shell middens are the most common, and certainly the most visible, aspect of the archaeological record along the coastlines of the world. These accumulations of mollusc shells and other occupational debris represent locations where prehistoric peoples exploited the abundant natural resources available in coastal environments. Shell middens are especially important in archaeological research because bone and other organic materials are generally well preserved within the molluscan deposits, offering the potential for a much more detailed reconstruction of prehistoric adaptations than is generally possible at most other kinds of archaeological sites.

The results of archaeological investigations at two prehistoric shell middens on the central Oregon coast are presented in this volume. These two sites are located on the north slope of Yaquina Head near Newport, Lincoln County, Oregon. Although conducted on a relatively small-scale, these investigations were sufficient to establish the function and chronology of the occupations at these two sites. The information obtained as a result of this project constitutes a small, but substantive, contribution toward the reconstruction of the nature and antiquity of prehistoric occupation along the Oregon coast.

LOCATION AND SETTING

Yaquina Head is located 5 km north of the City of Newport on the central Oregon coast (Figure 1-1). This prominent headland is situated west of Agate Beach, in the NE 1/4 of Section 30, T10S, R11W, Willamette Meridian. The two archaeological sites investigated during this study (35LNC49 and 35LNC50) are situated on the north side of the headland where a small unnamed creek empties into the Pacific Ocean. Both shell middens are situated on the south bank of a gully formed by erosion of the spring- fed creek. The sites are sheltered by Yaquina Head from winds from the south, and their setting offers a wide view of the coast to the north (Figure 1-2).

The two shell middens are situated in a grassy meadow composed primarily of introduced species, primarily hairgrass (*Aira* sp.) and orchard-grass (*Dactylis* sp.), but also including Queen Anne's lace (*Daucus carota*) and ragwort (*Senecio jacobea*). A belt of native shrubs including salal (*Gaultheria shallon*), black twinberry (*Lonicera* sp.), salmonberry (*Rubus spectabilis*), and blackberry (*Rubus ursinus*) borders the site on the slope above.

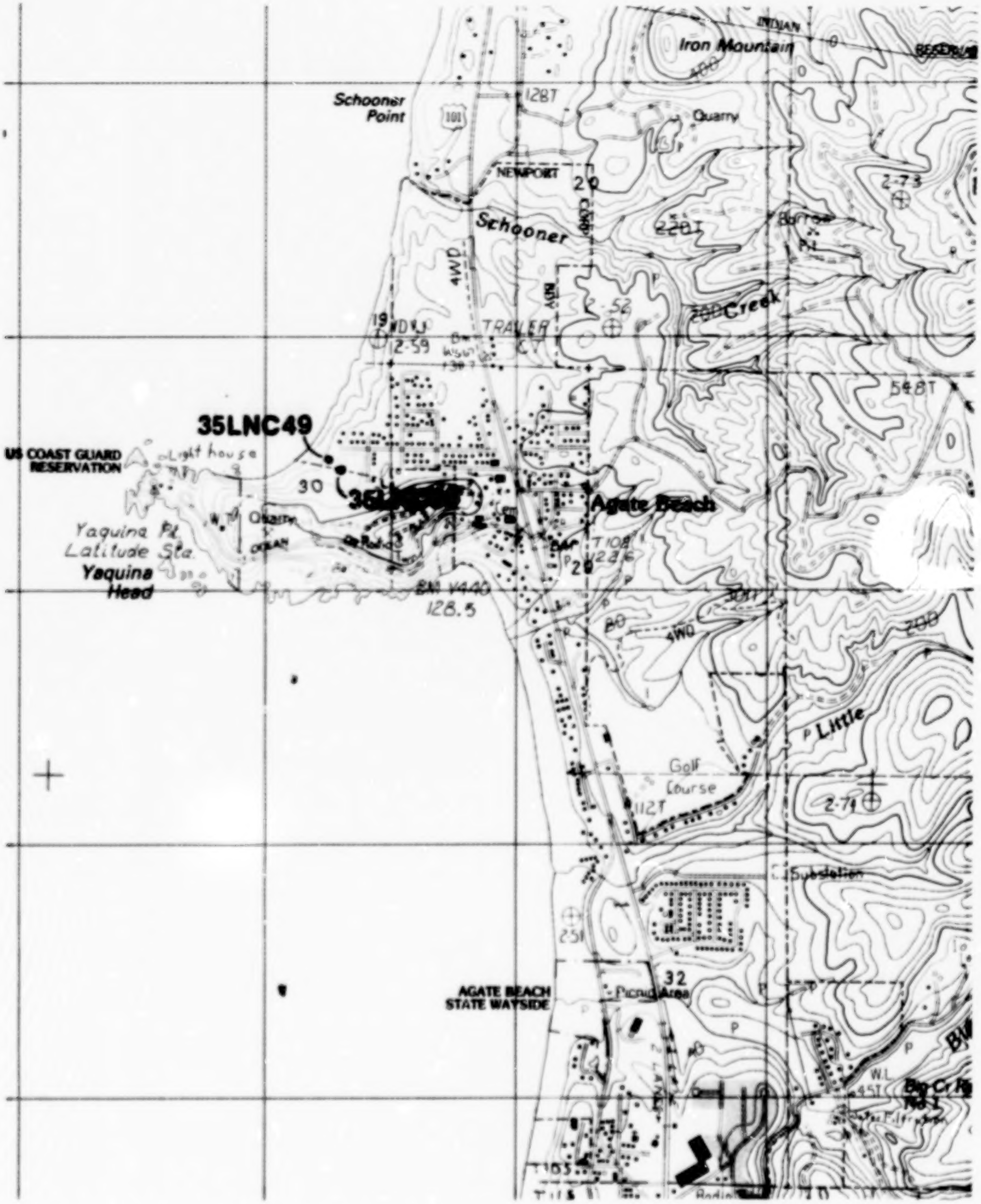

Figure 1-1. Location of the North Yaquina Head shell middens (35LNC49 and 35LNC50) north of Newport (USGS Newport North 7-1/2' quadrangle, 1984).

ETHNOGRAPHIC INHABITANTS

At the time of historic contact, Yaquina Head was situated within the territory of the Yaquina Indians who, along with the neighboring Alsea to the south, spoke closely related dialects of the single language comprising the Alsean language family. This language family has, in turn, been traditionally placed in the Penutian linguistic phylum, suggesting distant linguistic ties with other Penutian speakers, such as the Siuslaw, Lower Umpqua, and Coos peoples to the south and the Chinook to the north, along the Oregon coast (Thompson 1973:993-994). The presence of these distantly related language groups suggests that Penutian speakers have inhabited the Oregon coastal region for a substantial period of time, perhaps as long as several thousand years. In view of this situation, and considering the chronology of the occupations at these shell middens, it is likely that the North Yaquina Head shell middens were occupied by the ancestors of the Yaquina Indians.

Unfortunately, relatively little information is available about the subsistence and settlement practices of the Yaquina Indians. J. Owen Dorsey, who recorded ethnographic and linguistic information on the Yaquina during a visit to the Siletz Reservation in 1884, compiled a list of 56 named sites, but most have no locational descriptions (Dorsey 1890:229-230). Not surprisingly, none of the sites for which locational data is available can be correlated with the North Yaquina Head shell middens. The Yaquina and other native peoples inhabiting the Oregon coast at the time of historic contact are known to have resided in permanent villages during the winter, with a range of less permanent settlements visited during the remainder of the year. Considering the nature of the cultural remains found, the shell middend on the north side of Yaquina Head appear to represent two of these seasonally-occupied campsites. It is clear that at this point in time the only way to learn more about the lifeways of the ancestral Yaquina Indians is through archaeological research.

PREVIOUS TESTING

Archaeological testing was initially carried out at the North Yaquina Head shell middens in 1980 by archaeologists from Oregon State University (Snyder and Ross 1980). This testing program was conducted in response to plans for construction of a housing subdivision on top of these archaeological sites. Site 35LNC49 was exposed in the face of a steep cliff above the ocean, while 35LNC50 was located a short distance inland along the north slope of Yaquina Head. Both sites consisted of layers of marine shells containing animal bones, artifacts, and cracked rock from cooking fires indicating occupation by prehistoric peoples.

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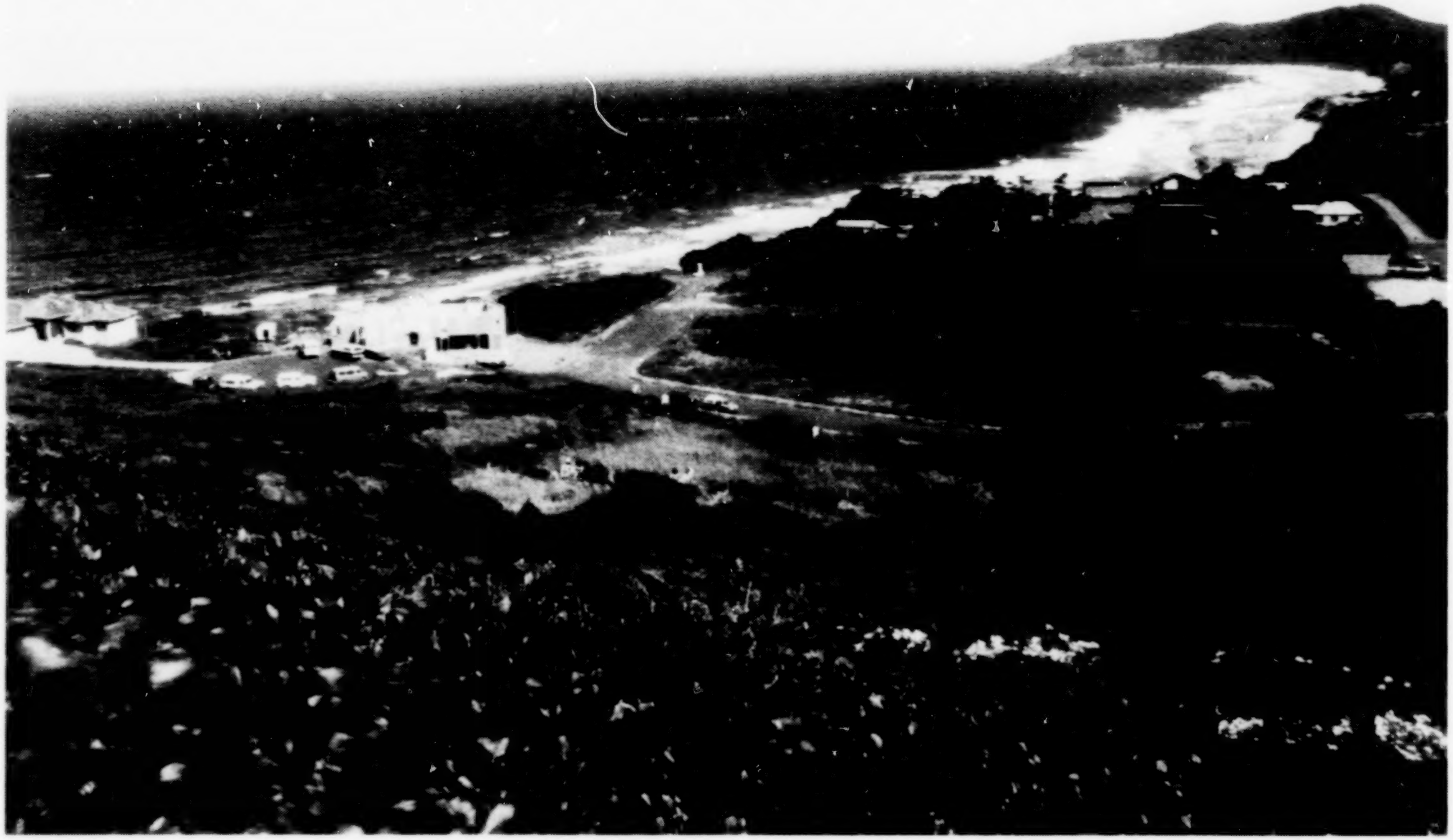


Figure 1-2. View to the north of the North Yaquina Head shell middens with Cape Foulweather in the distance. Site 35LNC49 underlies the houses on the left, while 35LNC50, where excavations are in progress, occupies the lower middle portion of the photograph.

PROJECT SCOPE

The smaller of the two shell middens, 35LNC50, extends into the Yaquina Head Outstanding Natural Area administered by the Bureau of Land Management. The boundary between the federal property and the housing subdivision had not been permanently defined on the ground and was potentially subject to trespass. Accordingly, the BLM proposed to conduct a boundary line survey and then construct a fence along the property line. Small-scale archaeological investigations were undertaken to mitigate the effects of property fence construction across 35LNC50.

In anticipation of the investigations on the portion of 35LNC50 on federal property, a reassessment of the 1980 test excavations at 35LNC49 and 35LNC50 by Oregon State University was undertaken (Minor and Greenspan 1986:107-125). Since the results of this earlier work had never been more than cursorily reported, this reassessment by HRA included analysis of the artifacts and faunal remains recovered during the earlier test excavations. The results of the 1980 test excavations are combined with the information obtained from 35LNC50 during the current project to present as complete a picture as possible of prehistoric occupation at these two shell middens.

CHAPTER 2

GEOMORPHOLOGY AND SOILS

by Patricia F. McDowell

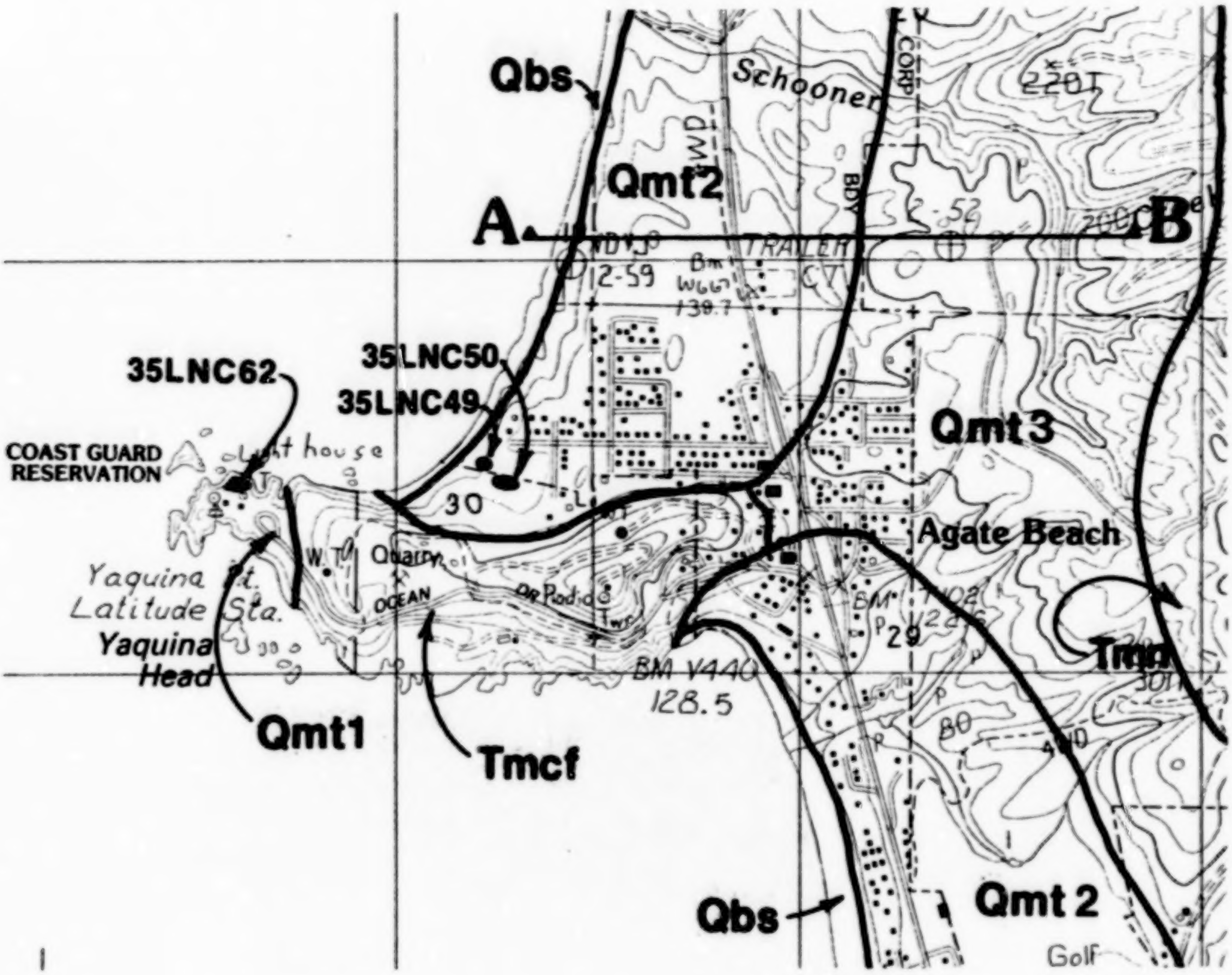
Yaquina Head consists of a body of Cape Foulweather basalt surrounded by Nye mudstone (Figure 2-1). The more resistant basalt forms the headland. The softer mudstone to the north and south was eroded downward by wave action during Pleistocene high sea-level stands to form marine terraces (Schlicker et al. 1973). Subsequent tectonic uplift raised these terraces above the level of the present interglacial high sea-level stand. During the present high sea-level stand (achieved only within the last 6,000 years), wave action and associated mass movement have eroded the edge of the marine terraces eastward, forming a sea cliff along the terraces and leaving the more resistant rock of Yaquina Head as a prominent point (McDowell 1987a).

GEOMORPHIC SETTING

Sites 35LNC49 and 35LNC50 are located on a marine terrace (*Qmt2* in Figures 2-1 and 2-2) that extends north from Yaquina Head. A marine terrace similar in morphology and elevation, and presumably correlative, extends southward from Yaquina Head as well. Based on soil morphology (Soil Conservation Service n.d.), elevation, and topographic relationships, this terrace is probably the Whiskey Run terrace, the youngest marine terrace that is widely recognized on the Oregon Coast.

At the eastern edge of the Whiskey Run terrace is a steep slope (a former sea cliff) leading up to a higher, less extensive marine terrace, probably the Pioneer terrace. Both the Whiskey Run and the Pioneer terraces in this vicinity are dissected by streams, such as Schooner Creek, that have cut narrow valleys down to present sea level. The Whiskey Run terrace is thought to date from an interstadial high sea-level stand at approximately 82,000 years BP, while the Pioneer terrace is thought to date from the last interglacial high sea-level stand, which ended at approximately 103,000 years BP (Adams 1984).

A lower surface mantled with sandy sediments (*Qmt1*, about 20 m above sea level) is present on the western tip of Yaquina Head (McDowell 1987b). *Qmt1* in this vicinity appears to be a separate marine terrace surface from the Whiskey Run terrace, but it is possible



KEY

Qbs: Holocene beach sand and sea cliffs
Qmt: Quaternary marine terraces, including incised valleys; generally underlain by Astoria Formation (middle Miocene; sandstone and siltstone)
Qmt1: 70' terrace (20 m)
Qmt2: Whiskey Run 120' terrace (35 m)
Qmt3: Pioneer 200' terrace (60 m)
Tmcf: Uplands of Cape Foulweather basalt (middle Miocene)
Tib: Uplands of Miocene intrusive basalts
Tmn: Uplands of Nye Mudstone (early Miocene; siltstone and sandstone), possibly including some higher marine terraces
Line A-B shows the approximate location of cross-section in Figure 2-2

Figure 2-1. Geomorphic-geologic map of the Yaquina Head vicinity (based on Schlicker and others [1973], Soil Conservation Service [n.d.], and limited field observations).

that they are offset or warped segments of the same terrace. If they are separate terraces, *Qmtl* probably is a younger interstadial terrace not previously recognized on the Oregon coast.

The marine terrace surface on which 35LNC49 and 35LNC50 are located is a complex of landforms created by the initial erosional and depositional wave action, and by subsequent geomorphic processes. When originally exposed by sea-level decline, the terrace probably had a gentle slope from the former sea cliff along its eastern margin down to the west, extending beyond the modern sea cliff at its western margin. This simple surface was later modified by (1) incision by streams graded to a lower sea-level, (2) deposition of colluvium from adjacent slopes, (3) deposition of eolian silt, and (4) deposition of dune sand derived from the beach. The distinctions among these deposits are discussed below in the section on soil-geomorphic relationships.

Sites 35LNC49 and 35LNC50 are located on a sloping surface that dips northward from the footslope of Yaquina Head into a drainageway cut into the marine terrace surface. The elevation of these sites is approximately 30 m above sea level, slightly lower than the typical Whiskey Run terrace surface elevation in this area. This is further evidence that these sites are located on a modified, somewhat younger part of the marine terrace surface. Stabilized dune sands that presently are perched on top of marine terraces and are truncated by sea cliffs were found at 35LNC62 at the tip of Yaquina Head (McDowell 1987b), and were also noted in this area by Cooper (1958). However, no dune sand was encountered in the 35LNC50 excavations, although it does occur south of the site at the Yaquina Head quarry, and west of the site in the exposed sea cliff edge at 35LNC49.

Today these archaeological sites stand well above the beach, and access to the beach is by a steep path down a ravine cut into the sea cliff. It has been argued that during the occupation of 35LNC62 at the tip of Yaquina Head between 2000 and 5000 BP, a sand apron may have connected this site to the beach below (McDowell 1987b). The presence of eolian sand along the exposed and eroded sea cliff at 35LNC49 suggests that a sand apron may formerly have been present here as well.

During the period of prehistoric occupation, the immediate geomorphic setting of the two shell middens was probably not significantly different from present-day conditions, except for the possible presence of the sand apron. These sites offered several locational advantages for prehistoric occupation. They sit on the nearest flat land surface to the beach. Access to the beach probably was not difficult even without a sand apron (a situation that was not true at 35LNC62.) In addition, the site was sheltered from southerly winter winds by the spine of Yaquina Head.

SOIL-GEOMORPHIC RELATIONSHIPS

Soil profile information from the study area (Soil Conservation Service n.d.) reveals the characteristics and stratigraphic relationships of several distinct geomorphic deposits occurring on the marine terraces. A discontinuous, narrow band of Bandon fine sandy loam, mapped at the western edge of the Whiskey Run terrace from Schooner Creek to Moolack Creek, is representative of the eolian sand deposits. In this soil area, the eolian fine sand is more than 150 cm thick, and a spodosol with a cemented, strong brown ortstein horizon has developed at a depth of 50 to 90 cm.

A broader, nearly continuous band of Nelscott silt loam occupies the central part of the Whiskey Run terrace surface. Nelscott silt loam is a composite soil, with an upper layer of ashy eolian silt (typically about 50 to 80 cm thick) overlying sandy marine terrace (or possibly eolian) deposits. The lower sandy deposits have soil development morphologically similar to the Bandon series, including an eluvial horizon and an ortstein horizon. Above this, in the eolian silt, is an A horizon and a structural Bw horizon.

Another soil, the Lint silt loam sandy substratum, occurs at the eastern edge of the Whiskey Run terrace surface and on the footslope of the escarpment leading up to the Pioneer terrace (the Whiskey Run terrace sea cliff). The Lint silt loam sandy substratum is stratigraphically and pedogenically similar to the Nelscott, with an A/Bw profile, but it has a thicker (about 100 cm) layer of eolian silt. Soil development observed at 35LNC50 is similar to the Lint silt loam sandy substratum.

A fourth soil series, the Lint silt loam, occurs on the Whiskey Run sea cliff and the Pioneer terrace surface. It is formed in ashy eolian silt over a silty clay loam or silt loam of uncertain origin. The deeper deposits may be weathered marine terrace deposits of Pioneer age, alluvium-colluvium from subaerial modification of the Pioneer surface, or perhaps even an older generation of ashy eolian silt modified by weathering. Pedogenic development in the ashy eolian silt is similar to that in the upper part of the Lint silt loam sandy substratum. This suggests that, although the Lint silt loam is in a higher, older geomorphic position than the Lint silt loam sandy substratum, the upper silty mantle in both soils may be the same age.

These soil-stratigraphic relationships indicate that the surficial sandy deposits at the western edge of the Whiskey Run Terrace (Bandon soil) and the deeper sandy deposits of the Nelscott silt loam are different depositional units, separated stratigraphically and temporally by the silty eolian material in the upper part of the Nelscott and Lint soils (Figure 2-2). The deep sandy deposits are eolian and/or marine terrace sediments that predate human occupation

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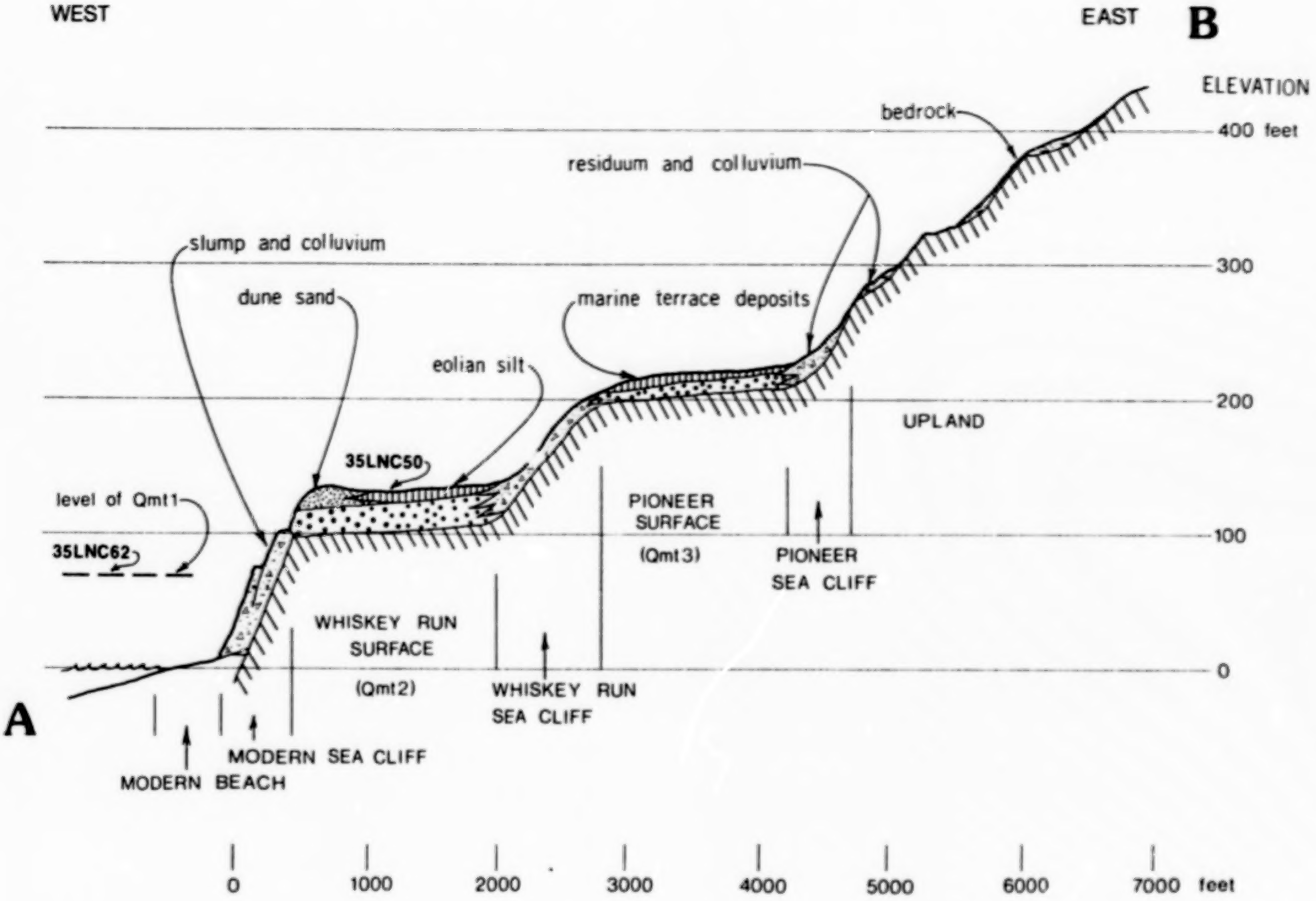


Figure 2-2. Generalized east-west cross-section of marine terraces north of Yaquina Head. Inferred stratigraphic relationships of Quaternary deposits are shown. Vertical exaggeration is 10x. Scale is approximate.

in this region. They are probably pre-Holocene in age and possibly date from the end of the high sea-level stand that formed the Whiskey Run terrace. Subsequently, ashy eolian silt was deposited as a mantle over much of the Whiskey Run and Pioneer terrace surfaces. Finally, the surficial sandy deposits at the western edge of the Whiskey Run terrace were deposited by eolian deposition. Archaeological remains at 35LNC62 are mantled by eolian sands (McDowell 1987b), indicating that eolian deposition occurred in the late Holocene, but it may have begun as early as 18,000 to 10,000 years ago and continued intermittently up to the present day (Cooper 1958; McDowell 1986).

SEDIMENT ANALYSIS

A profile of the south wall of Units A and B at 35LNC50 was described and sampled (see Table 3-1), following the procedures of the Soil Survey Staff (1975). In nearby Unit C, samples of fire ash lenses were taken, and an auger hole was drilled to a depth of 2.5 m below the land surface. Because the overall stratigraphy is fairly uniform across this site, samples from deep in this auger hole were treated as a continuation of the profile in Units A and B. A brief field examination was made of exposures in the sea cliff to the west at 35LNC49, as well as in the upper part of the Yaquina Head quarry exposure, to get an overview of sediment types in the area.

Sediment size data were obtained by wet sieving and hydrometer analysis (Gee and Bauder 1986). Hydrometer samples high in organic matter were pretreated with sodium hypochlorite to remove organic matter. Moist and dry colors were obtained using a Munsell color book. Soil pH was measured using a pH meter in a 1:1 suspension of soil to water. Oven-dry samples were heated in a furnace at 430° C for 4 to 5 hours to determine loss-on-ignition (LOI) (Davies 1974).

All samples from the excavation units at 35LNC50 are poorly sorted loam to sandy loam. The particle size distribution of each sample is dominated by sand, but silt and clay content is also significant (Table 2-1). The sediments at 35LNC50 are significantly higher in silt and clay than the dune sand deposits at site 35LNC62. Particle size distributions within the profile analyzed at 35LNC50 are affected by (1) variations in the amount of anthropic shell from stratum to stratum, and (2) variations in the sedimentology of the soil parent material. Strata 1 through 3 all have gravel contents of 35% or more, but the gravel-sized particles are virtually all anthropic shell fragments. In strata 1 through 3, the sand particles are also mainly fine shell fragments, and it appears that the initial parent material before human occupation was probably a silt loam. The non-cultural component of the 35LNC50 deposits, therefore, is probably the ashy eolian silt discussed above, or a mixture of eolian silt and colluvium from the Yaquina Head slope to the south.

Table 2-1. Sediment size data from 35LNC50.

Soil Sample	Stratum	% gravel/shell* (>2.0 mm)	% sand (2.0-0.062 mm)	% silt (0.062-0.004 mm)	% clay (<0.004 mm)
A-2	1A	34.9	45	42	12
A-3	1B	35.3	35	43	22
A-4	2	62.0	59	27	13
A-5	3	39.5	43	44	13
A-6	4	0.4	35	52	13
C-2	4 subsoil	0	57	29	14

* includes some organic matter

Note: Percentage gravel is calculated on the total sample. Percentage sand, silt, and clay are calculated on the gravel-free fraction.

The highest sand and gravel content occurs in Stratum 2, the heavy shell layer. The shell content of strata 1 and 3 may be due to either direct anthropic shell deposition in these strata, at a lower rate than in Stratum 2, or to post-depositional mixing of shell upward and downward from Stratum 2 by faunal activity and physical processes. Stratum 4 has a low gravel content because it is very low in shell, and it has only a moderate sand content. The auger hole in Unit C revealed non-sandy silt loam or silty clay loam down to about 2 m below the land surface, with sand content increasing below 2 m. This deep sandier subsoil of Stratum 4 has no anthropic shell content, but it has a higher content of non-anthropic sand than the other samples analyzed. This subsoil probably represents a sandier phase of marine terrace deposits.

Soil development at 35LNC50 has been dominated by accumulation of organic material through natural and human processes, humification of raw organic matter, accumulation of shell by human processes, and development of soil structure. The soil is also affected by mixing by physical processes and faunal activity. The major anthropic feature in the profile is the heavy shell layer (Stratum 2). This layer was laid down by direct human action, and was buried by about 25 cm of loam, comprising the sod and Stratum 1. The origin of this upper 25 cm may be human, natural, or a combination of both. Apart from shell content, the sediment characteristics, LOI, pH, and soil structure of Stratum 1 are similar to those of strata 3 and 4, underlying the shell layer. This suggests that the sod and Stratum 1 were created by processes similar to those that created strata 3 and 4.

Organic matter content, as indicated by LOI analysis (Table 2-2), is high throughout the profile. The granular structure which is present down to the upper part of Stratum 4 is typical of organic-rich mineral soil where soil faunal activity is high. The pH values are neutral to moderately alkaline throughout the profile, probably due to the input of bases from breakdown of the shell.

The profile shows no discontinuation in parent material that would indicate a buried soil surface, other than the main shell midden layer (Stratum 2). Strata 3 and 4 were probably the original natural soil A horizons before deposition of the shell layer. Stratum 3 was modified by human inputs (shell, organic material, charcoal) before or during deposition of Stratum 2. The upper part of Stratum 4 does not have significant shell input, but it does contain bisque, slightly hard lumps of soil material, probably with some clay content, having a bright orange color that is inferred to have resulted from contact with fire. Stratum 4 also shows chemical enrichment (as discussed below).

CHEMICAL ANALYSIS

Ten soil samples were submitted to Chemex Labs Inc. of Sparks, Nevada, for chemical analysis. These samples were sieved to separate the finer than 0.18 mm fraction, which was then digested in a perchloric-nitric-hydrofluoric acid mixture and analyzed by ion-coupled plasma-

Table 2-2. Organic matter content and pH.

Soil Sample	Stratum	Depth (cm)	% LOI	pH
A-2	1 upper	6-15	18.7	6.6
A-3	1 lower	15-25	19.8	7.9
A-4	2	25-35	10.6	7.9
A-7	fire ash	30-35	6.0	7.5
A-5	3	35-55	16.0	7.6
A-6	4	55-67	16.1*	7.3
C-4	4	60-70	16.4	7.2
C-1	4 subsoil	170-175	10.0	6.5
C-2	4 subsoil	240-250	6.3	7.5
F-1	fire ash	30-40	5.1	7.6

* Two 5-hour burns were required to complete combustion of organic material.

atomic emission spectrophotometry. This procedure breaks down mineral and organic material, giving total elemental content.

One potential problem in the interpretation of the chemical data at 35LNC50 is the possible influence of one variable with high and variable values on other variables in percentage data. The extremely high percentage values of Ca and of organic matter (as indicated by loss-on-ignition) in the midden strata might depress percentage values of the other elements, affecting their patterns of down-profile variation. To determine if this effect was present in the data, adjusted values of P, Mg, K, Na, Fe, Al, and Mn were calculated on a Ca- and LOI-free basis, and adjusted LOI was calculated on a Ca-free basis.

These values were plotted and the plots were compared to unadjusted values (Table 2-3, Figure 2-3). The adjusted values were higher than unadjusted values, but the adjusted values of each component showed the same pattern of down-profile variation as the unadjusted values. The unadjusted percentage values can therefore be considered as valid indicators of the stratigraphic patterns of variations in chemical composition, and the unadjusted values were used for interpretation.

Soil material at 35LNC50 is anthropically--that is, unintentionally affected by human occupation (Eidt 1984)--enriched in only two elements, phosphorus (P) and calcium (Ca) (see Table 2-3, Figure 2-3). P enrichment in anthropic soils is due to inputs of human and animal waste, and food processing waste. Total P content in the archaeological strata at 35LNC50 varies from 1500 to 3800 ppm, while typical non-anthropic soils have 800 ppm P (Bowen 1979), and the deep sterile samples at 35LNC50 have less than 800 ppm. At inland archaeological sites in Oregon, P content of 1000 ppm proved to be an empirical minimum threshold value indicating cultural enrichment (McDowell 1987c, 1988), and the data from 35LNC50 support this threshold definition. Total Ca content in the archaeological strata at 35LNC50 ranges from 21% to greater than 25%, while typical Ca content of non-anthropic soils is 1.5% (Bowen 1979), and the deep sterile samples at 35LNC50 have less than 1% Ca. High archaeological Ca levels are due to the presence of shell and bone.

Levels of magnesium (Mg), potassium (K), sodium (Na), iron (Fe), aluminum (Al), and manganese (Mn) at 35LNC50 all are lower than typical values for non-anthropic soils (Bowen 1979), so there is no direct evidence of cultural enrichment of these elements at 35LNC50. Soil pH is neutral to slightly alkaline in most of the cultural strata and the fire ash lenses, due to Ca leaching from the shell. Stratum 1 is slightly acidic, because it is low in shell fragments and is subject to the greatest leaching. Stratum 4, although below the shell midden, has a pH similar to strata 2 and 3. Bases filtering down from above probably are responsible for elevating its pH. It is reasonable to expect pH to decrease in the deeper subsoil, which is free of shells and is removed from base input from the shell midden. Soil sample C-1, at 172

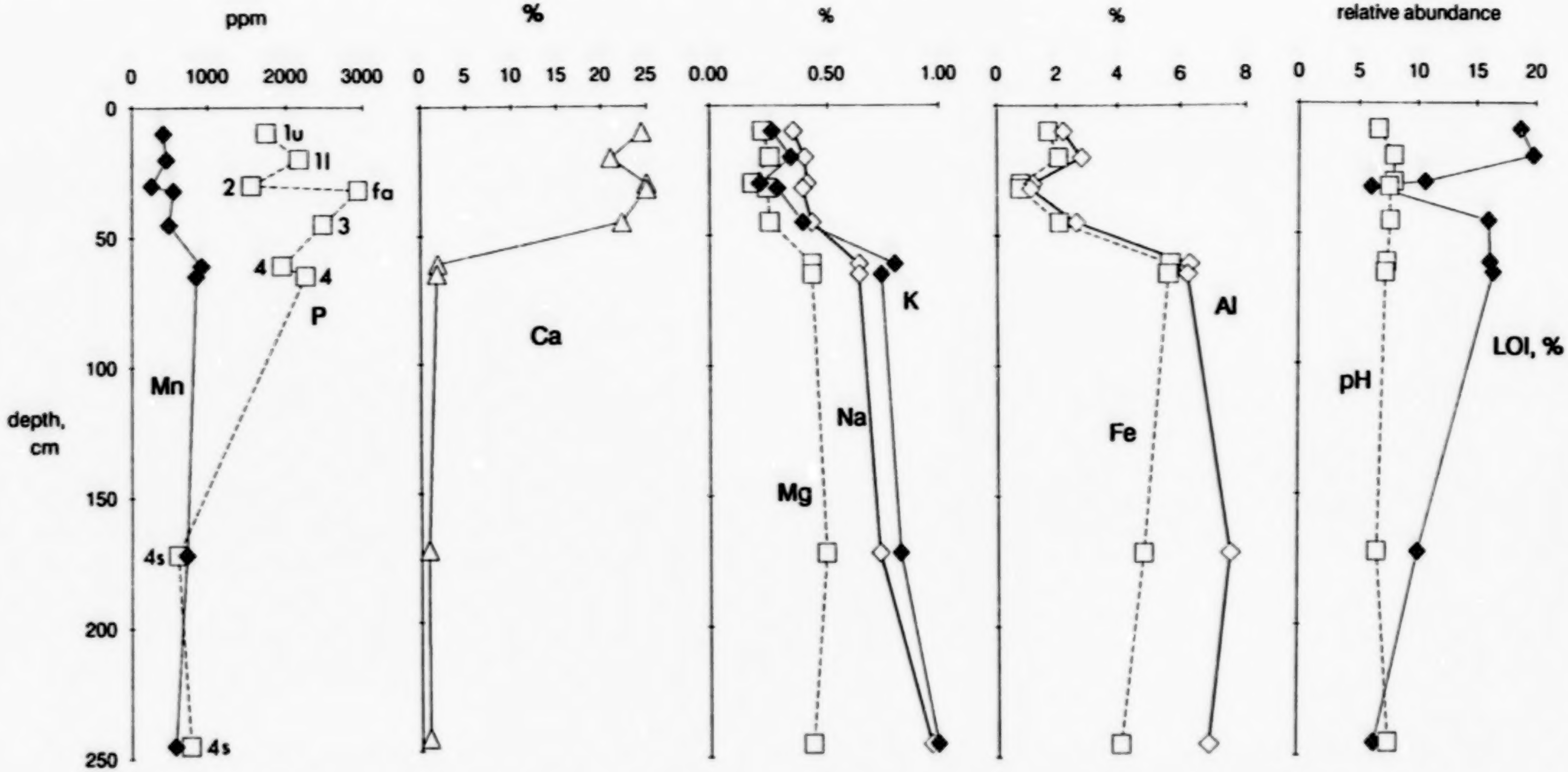


Figure 2-3. Stratigraphic variation in soil chemistry. Data from all samples in Units A and B only are plotted. Numbers beside data points on P plot indicate the stratum of the sample.

Table 2-3. Soil chemical data.

Soil Sample	P*	% Ca	% Mg	% K	% Na	% Fe	Mn*	% Al
A-2	1750	24.5	0.22	0.26	0.35	1.71	422	2.22
A-3	2160	21.1	0.25	0.34	0.40	2.06	463	2.82
A-4	1560	>25.0	0.18	0.21	0.41	0.79	267	1.19
A-7	2940	>25.0	0.25	0.28	0.39	0.76	553	1.12
A-5	2470	22.3	0.43	0.39	0.43	2.07	497	2.64
A-6	1950	1.94	0.24	0.80	0.64	5.67	918	6.26
C-4	2250	1.81	0.43	0.74	0.64	5.61	852	6.20
C-1	620	0.88	0.49	0.82	0.73	4.80	734	7.45
C-2	790	0.91	0.43	0.99	0.96	4.02	588	6.77
F-1	3770	>25.0	0.40	0.34	0.43	0.78	431	1.39

* Parts per million

cm, has the lowest pH. Interestingly, soil sample C-2, at 245 cm, has a pH equivalent to the shell midden strata. Perhaps this deep sample includes some marine terrace sediment, which may be higher in bases than the eolian silt.

An important stratigraphic question concerns the degree of cultural influence on Stratum 4. In the field, this stratum did not appear to be convincingly cultural in origin, containing primarily charcoal and bisque, although later analyses confirmed that it had also yielded a couple flakes and a small number of vertebrate faunal remains. The two soil samples analyzed from Stratum 4, however, both have high P values, indicating cultural enrichment. There are three possible explanations for these high P values.

First, perhaps Stratum 4 was culturally sterile before the shell midden was established over it, and P-rich material was mixed into it by non-cultural processes after or during deposition of the shell midden. This possibility seems unlikely because mixing would include Ca-rich material as well as P-rich material, yet Ca content is low in both samples from Stratum 4.

Second, the portion of Stratum 4 sampled during this project may represent a land surface occupied by prehistoric peoples adjacent to the earliest shell deposits, which was then buried by the shell midden as it expanded laterally. This explanation requires very sharp spatial segregation of shell deposition during the earliest occupation at the site, to allow virtually no contamination of Stratum 4 with shell fragments and Ca.

Third, Stratum 4 may represent a land surface occupied by prehistoric peoples before the shell midden was established at this site. This third possibility seems most feasible. Stratum 4 is unlike the cultural strata in every chemical characteristic except P, suggesting that it represents a type of anthropic influence on the soil distinctly different from that of the overlying strata. Whether there was a pre-shell midden occupation at the site, and its temporal relationship to the subsequent overlying shell midden, are questions best answered with archaeological data.

Stein (1984) has examined Puget Sound shell middens with two distinct strata, a very shelly stratum and an underlying stratum with a black fine-textured matrix containing a few shells. She concluded that the differences between the strata were due to differences in cultural deposition, rather than pedogenic processes. Her conclusion is consistent with the findings of this study. The lower stratum of Stein, however, is not like Stratum 4 at 35LNC50, because it contains some shells, and it has a CaCO3 content nearly as high as the overlying shell-rich stratum. Stein's lower stratum is probably similar to Stratum 3 at 35LNC50.

The data for Mg, K, Na, Fe, Al, and Mn show that the strata fall into two chemical groups. The chemical characteristics of the upper cultural strata (strata 1, 2, 3, and the fire ash lenses) are generally similar, and they are all lower in these elements than the lower non-shell strata (Stratum 4 and the deeper subsoil of Stratum 4). This probably reflects normal pedogenic leaching of these elements from the upper part of the soil profile, or naturally lower levels of these elements in anthropic material.

Two samples of fire ash material (A-7 from 30-35 cm, and F-1 from level 30-40 cm) were analyzed to document how their chemical characteristics differ from adjacent midden strata. These data will be useful in recognizing fire remains in future studies of archaeological sites where such features are less obvious. The two samples, although from different hearths, had very similar chemical characteristics. They are very high in Ca and high in visible shell fragments, indicating that shellfish were heated in the fire. These two samples have the highest P content of all of the samples analyzed. They have only low to moderate levels of Mg, Na and Fe, elements which other researchers have suggested are associated with fire hearths (e.g., Griffith 1981).

SUMMARY

Sites 35LNC49 and 35LNC50 are located on the edge of a small drainageway on an ancient marine terrace which is much older than these archaeological sites. There is little evidence of post-occupation geomorphic disturbance of the sites, apart from faunal mixing. The overlying Stratum 1 at 35LNC50 may have resulted from eolian deposition or natural colluvial depositional processes after creation of the shell midden (Stratum 2), or they may have resulted from non-shelly anthropic deposition. Strata 3 and 4 were formed from a fairly uniform silty parent material by pedogenic processes and human inputs. The cultural strata show strong anthropic enrichment in Ca and P. Stratum 4 has a pattern of chemical enrichment distinct from that of strata 1 through 3, possibly indicating human occupation of the site before establishment of the shell midden.

CHAPTER 3

THE 1980 TESTING PROGRAM AT THE NORTH YAQUINA HEAD SHELL MIDDENS

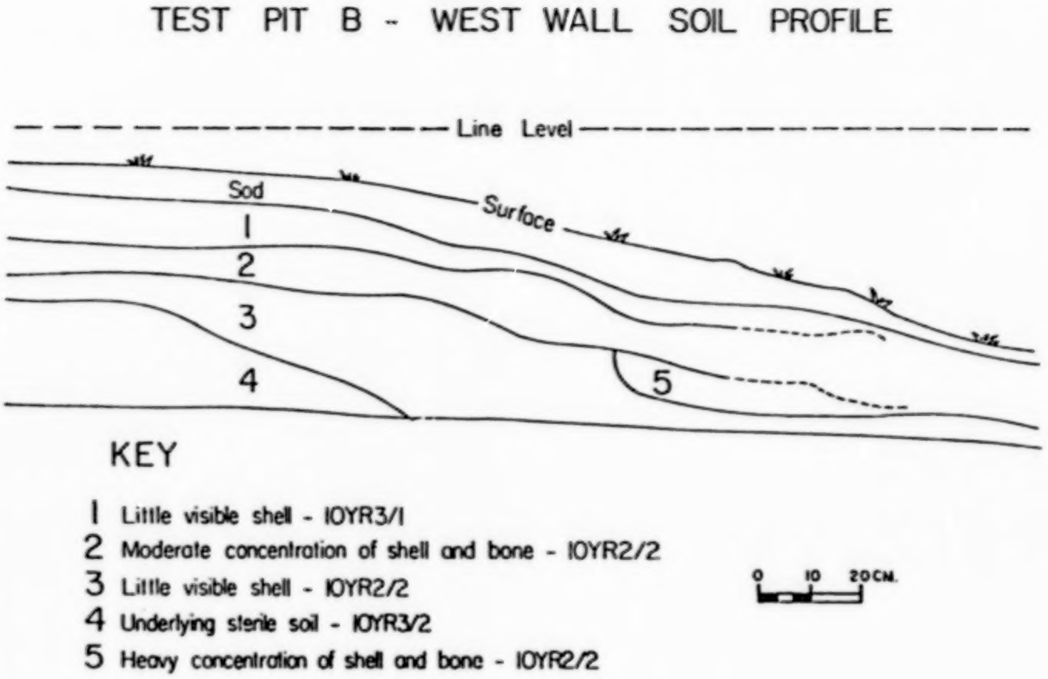
In 1980 a brief program of test excavations was carried out at the two shell middens on the north side of Yaquina Head by archaeologists from Oregon State University. This testing program was conducted in response to plans for development of a housing subdivision in the area and, accordingly, this fieldwork was carried out entirely on private land. A total of 60 auger holes, five test trenches, and five 1 x 2 m test pits were excavated during the testing program, with the fill from these units passed through 6.3 mm (1/4-inch) mesh screen.

This chapter represents an update of the discussion of these sites previously presented (Minor and Greenspan 1986), which was based in part on the OSU project report (Snyder and Ross 1980). To supplement the information contained in the original testing report, the collections recovered from 35LNC49 and 35LNC50 by Oregon State University were examined by HRA. In addition, both artifacts and vertebrate faunal remains were collected by HRA personnel from disturbed areas of 35LNC49 in 1988. The description and analysis of the materials recovered during the OSU excavations were accomplished by HRA and includes classification of the artifacts by Rick Minor and identification of the vertebrate faunal remains by Ruth L. Greenspan and Rebecca J. Wigen.

35LNC49

This shell midden, referred to as Site B in the 1980 project report, had been heavily disturbed by bulldozing, and in places the shell layer had been removed down to the underlying sterile soil. Most of this disturbance was caused by removal of a portion of the site's cultural deposits to form an earthen dam across the small creek as a means of creating a stock pond. Based on the results of the auger testing, it was determined that this shell midden had once covered an area extending south from the creek for approximately 36 m. The east-west dimensions of the site were less certain, due to the disturbance from bulldozing, but the midden appears to have extended for at least 30 m (Snyder and Ross 1980:13).

The reported stratigraphy varied somewhat between the test pits, with three to four strata represented (Figure 3-1). Stratum 1 was the sod layer. The shell midden was contained in strata 2 and 3. In Test Pit B, the midden concentration occurred in Stratum 2, with little


TEST PIT B - WEST WALL SOIL PROFILE
Line Level
Sod
Surface
1
2
3
4
5
KEY
1 Little visible shell - 10YR3/1
2 Moderate concentration of shell and bone - 10YR2/2
3 Little visible shell - 10YR2/2
4 Underlying sterile soil - 10YR3/2
5 Heavy concentration of shell and bone - 10YR2/2
0 10 20 CM.

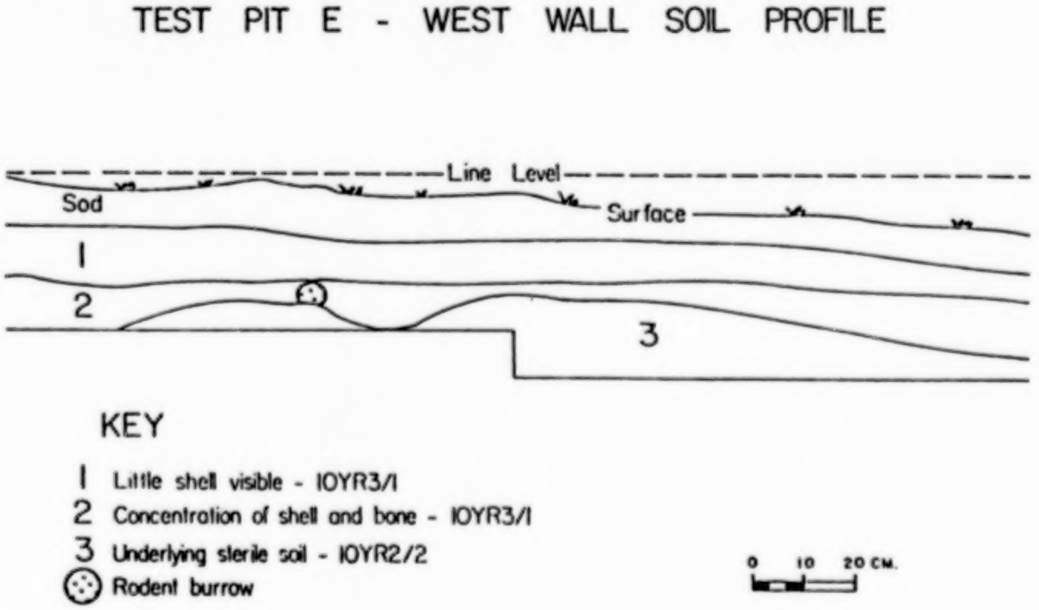

TEST PIT E - WEST WALL SOIL PROFILE
Line Level
Sod
Surface
1
2
3
KEY
1 Little shell visible - 10YR3/1
2 Concentration of shell and bone - 10YR3/1
3 Underlying sterile soil - 10YR2/2
Rodent burrow
0 10 20 CM.

Figure 3-1. Stratigraphic profiles from 35LNC49 (from Snyder and Ross 1980:29,31).

Table 3-1. Inventory of vertebrate faunal remains from 35LNC49.

			OSU	HRA	Level Below Surface					
Taxon	Common Name	Trench	Surface	Surface	2	3	4	5	6	Total
TERRESTRIAL MAMMALS:										
Odocoileus hemionus	Mule deer	9		1						10
Cervus elaphus	Elk	1		1	1		5			8
Cervidae	Elk and deer			1		1	3			5
Carnivora	Carnivore	1								1
MARINE MAMMALS:										
Phoca vitulina	Harbor seal	3		2	6	4				15
Eumetopias jubatus	Steller sea lion			5			1			6
Pinnipedia	True and eared seals		3	1		7				11
Delphinidae	Dolphins					2				2
Enhydra lutris	Sea otter		1		1					2
Otariidae	Eared seals		1							1
UNIDENTIFIED MAMMALS		52		1	52	13	59	3		180
FISH:										
Onchorynchus sp.	Salmon and trout					4	4			8
Merluccius productus	Pacific hake	1			1		9		1	12
Embiotocidae	Surfperches	1								1
Ophiodon elongatus	Lingcod	1								1
Unidentified fish		2					2			4
BIRDS:										
Phalacrocorax sp.	Cormorants	1				2				3
Alcidae?	Auks and relatives	1								1
Anatidae	Large duck	1								1
UNIDENTIFIABLE BONE FRAGMENTS		19			12		4			35
TOTAL		93	5	12	73	33	87	3	1	307

shell visible in Stratum 3 (Snyder and Ross 1980:29). In contrast, in Test Pit E little shell was visible in Stratum 2, and the midden concentration occurred in Stratum 3 (Snyder and Ross 1980:31). Overall, judging from the profiles of the walls of the test pits, the cultural deposits at 35LNC49 appear to have been 20-35 cm thick. Stratum 4 was described as the underlying sterile soil (Snyder and Ross 1980:17).

Marine shells observed at this site include sea mussels and barnacles, with clams also represented. The vertebrate faunal collection recovered during the 1980 testing project was supplemented with specimens collected from the surface during the 1988 fieldwork at nearby 35LNC50. Represented among the animal bones from this site are marine and terrestrial mammals, fish, and birds (Table 3-1). Marine mammals include adult male Steller sea lion, adult harbor seal, adult dolphin, and adult sea otter. Elk and deer dominate the terrestrial mammal remains. In addition, much of the material classified as unidentified mammal can likely be attributed to elk and deer. The fish remains recovered from 35LNC49 include elements from Pacific hake, salmon, surfperch, and lingcod. Bird bones recovered include one specimen each from a large duck, an alcid (auk or relatives), and a large cormorant (probably *Phalacrocorax penicillatus*), medium-sized cormorant (probably *P. auritus*), and small cormorant (probably *P. pelagicus*).

Artifacts were recovered from three of the four 1 x 2 test pits (Units B, C, and E) and one of the two test trenches at 35LNC49. The assemblage recovered during the 1980 testing program consists of 90

Table 3-2. Inventory of artifacts from 35LNC49.

				Level Below Surface				
Artifact Class	Trench	OSU Surface	HRA Surface	2	3	4	5	6	Total
Projectile point					1				1
Flake knife				1					1
Graver			1						1
Used flakes	1		1						2
Core				1					1
Broken cobbles		2	1		1				4
Chert debitage	2	1	3	46	19	7		1	79
Basalt debitage				2	1	1			4
Hammer			1		1				2
Used pebble flake					1				1
Dauber				1					1
Bone wedge	1								1
TOTALS	4	3	8	51	24	8		1	98

Table 3-3. Summary of debitage types from 1980 testing at 35LNC49 and 35LNC50.

Flake	Type	35LNC49	35LNC50	Totals	%
Chert:	Complete	48	4	52	63.4%
	Broken	3		3	3.7%
	Fragment	11	1	12	14.6%
	Debris	14	1	15	18.3%
	TOTALS	76	6	82	
Basalt:	Complete	1	1	2	40%
	Debris	3		3	60%
	TOTALS	4	1	5	

items (Table 3-2). Chipped stone artifacts include a chert projectile point (TPC-3-1; Figure 3-2a) measuring 3.1 cm in length, 1.5 cm in width, 0.5 cm thick, and weighing 1.6 g. Other chipped stone artifacts include one chert flake knife (TPC-2-1; Figure 3-2b), one used chert flake (TR-1W-1; Figure 3-2c), and a chert core (TPC-2-3; Figure 3-2d). Cobble or pebble tools found during this project include a basalt hammer (TPE-3-1; Figure 3-2e), a used basalt pebble flake (TPE-3-2; Figure 8-3f), and a small elongated cobble exhibiting striations and partially covered with tar or asphaltum (TPC-2-2; Figure 3-2g). The remainder of the 1980 assemblage includes two broken chert cobbles (SF-1 and SF-2), a broken basalt cobble (TPC-3-2), 76 pieces of chert debitage, and four pieces of basalt debitage (Tables 3-3 to 3-5).

Table 3-4. Presence/absence of cortex on 1980 lithic debitage from 35LNC49 and 35LNC50.

	35LNC49		35LNC50		Totals	
Material	Cortex	Non-Cortex	Cortex	Non-Cortex	Cortex	Non-Cortex
Chert	22 29%	54 71%	--	6 100%	22 27%	60 73%
Basalt	3 75%	1 25%	1 100%	--	4 80%	1 20%

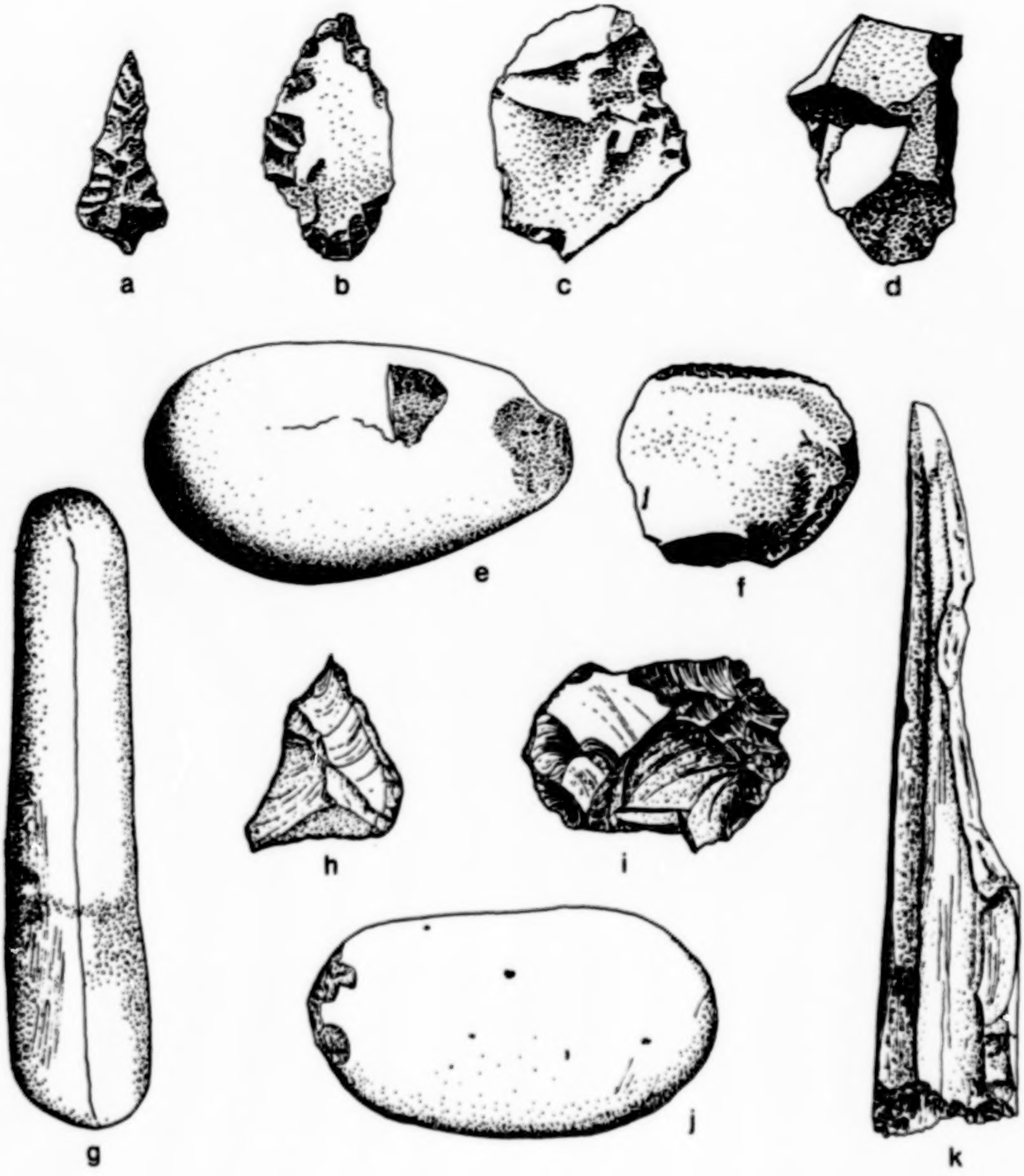


Figure 3-2. Artifacts from 35LNC49 (shown actual size except e. which is 65% actual size).

a. TPC-3-1
b. TPC-2-1
c. TR-1W-1
d. TPC-2-3
e. TPE-3-1
f. TPE-3-2
g. TPC-2-2
h. SF-4
i. SF-6
j. SF-3
k. SF-5

Table 3-5. Tabulation of 1980 debitage by raw material and size.

Flake Size (mm)	35LNC49		35LNC50		Totals	
	Chert	Basalt	Chert	Basalt	Chert %	Basalt %
0-5	1				1 (1.2%)	
5-10	29				29 (35.3%)	
10-20	17	1			17 (20.7%)	1 (20%)
20-30	18		1		19 (23.2%)	
30-40	5		2		7 (8.6%)	
40-50	4	1	3	1	7 (8.6%)	2 (40%)
50-60		1				1 (20%)
60-70	2	1			2 (2.4%)	1 (20%)
TOTAL	76	4	6	1	82	5

In addition, eight artifacts were collected from the surface of 35LNC49 during the 1988 fieldwork at nearby 35LNC50. These include a chert graver (SF-4; Figure 3-2h), a small basalt hammer (SF-3; Figure 3-2j), a used chert flake (SF-6; Figure 3-2i), a spall from a chert nodule (SF-7), a broken chert nodule (SF-8), one complete chert flake, one piece of chert debris, and a bone wedge (SF-5; Figure 3-2k).

35LNC50

This shell midden, referred to as Site A in the project report (Snyder and Ross 1980), extends from the gully formed by the spring-fed stream southward for 21 m to the public/private property boundary, with an east-west dimension of 31 m. A single 1 x 2 m test pit (Unit A) excavated in this area contained four distinct strata: Stratum 1, a thin sod layer; strata 2 and 3, containing marine shell, animal bones, and fire-cracked rocks; and Stratum 4, described as the underlying sterile soil.

Stratum 2, the upper layer of the cultural deposit, was distinguished from the lower cultural stratum by its greyish matrix and finely fractured marine shells. This stratum had a thickness of approximately 15 cm near the center of the shell midden (Snyder and Ross 1980:9). Stratum 3, the lower layer of the cultural deposit, was densely packed with marine shells, animal bones, charcoal, and fire-cracked rock, and contained very little soil. Judging from the profile of the test pit wall, this stratum appears to have averaged about 12 cm in thickness (Figure 3-3; Snyder and Ross 1980:28).

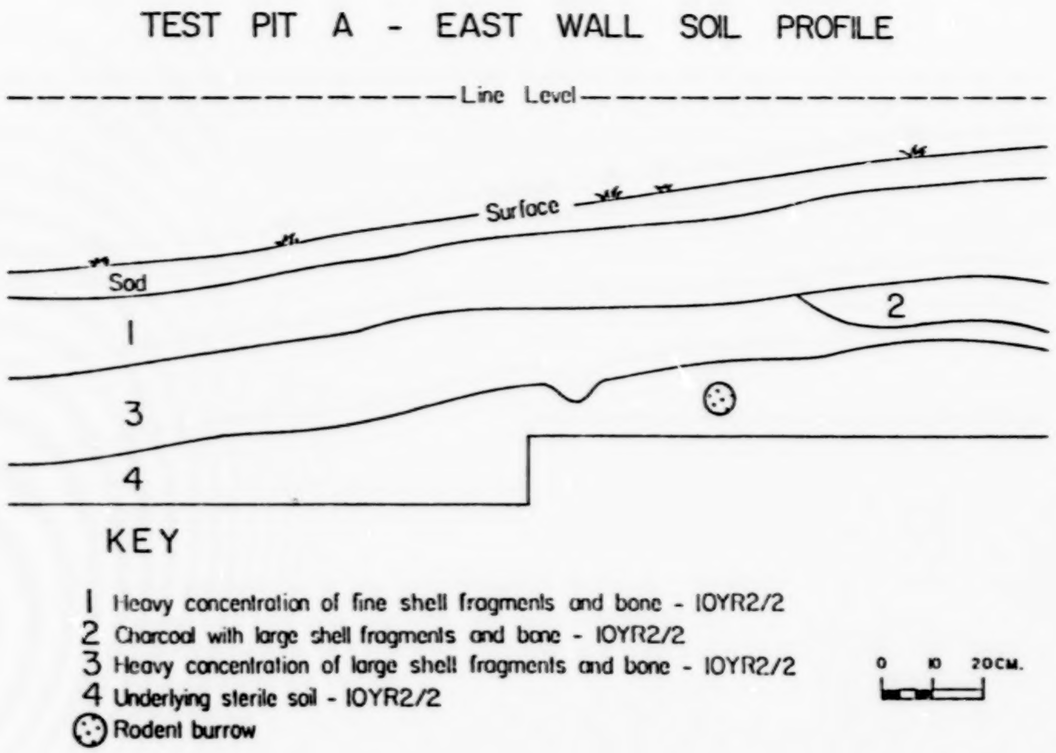

TEST PIT A - EAST WALL SOIL PROFILE
Line Level
Surface
Sod
1
2
3
4
KEY
1 Heavy concentration of fine shell fragments and bone - 10YR2/2
2 Charcoal with large shell fragments and bone - 10YR2/2
3 Heavy concentration of large shell fragments and bone - 10YR2/2
4 Underlying sterile soil - 10YR2/2
Rodent burrow
0
10
20CM.

Figure 3-3. Stratigraphic profile from 35LNC50 (from Snyder and Ross 1980:28).

Marine shell represented in these strata included sea mussels, barnacles, and clams (Snyder and Ross 1980:12). The vertebrate faunal collection (Table 3-6) includes both adult and juvenile harbor seals. In addition, several bones representing sea lions have been identified, including adult male and female Steller sea lions, several specimens that are probably also adult female Steller sea lion, but may represent adult male California sea lion, and one specimen of adult female northern fur seal. Adult and juvenile sea otter remains were found, as well as a single fragment of whale bone.

Terrestrial mammals in the assemblage include elk, deer, and a single rodent specimen. A number of mammal bones too fragmentary for positive identification were recovered; the size and texture of these fragments suggests that many of them represent elk and/or deer. Fish remains recovered include elements from Pacific hake, surfperch, rockfish, greenling, and lingcod. Birds identified in the faunal remains include large grebe, large cormorant (probably *P. pelagicus*), medium cormorant (probably *P. auritus*), large and medium ducks, common murres, Rhinoceros auklet, and unidentified alcids.

Artifacts recovered from 35LNC50 during the 1980 testing consisted

Table 3-6. Inventory of vertebrate faunal remains from 1980 testing, 35LNC50.

			Level Below Surface						
Taxon	Common Name	Sod	1	2	3	4	5	6	Total
TERRESTRIAL MAMMALS:									
Odocoileus hemionus	Mule deer				3	2			5
Cervus elaphus	Elk				3		1		4
Rodentia	Rodents				1				1
MARINE MAMMALS:									
Phoca vitulina	Harbor seal		2		5	2	1	52	62
Eumetopias jubatus	Steller sea lion						3	1	4
Callorhinus ursinus	Northern fur seal						1		1
Otariidae	Eared seals					4		12	16
Pinnipedia	True and eared seals				1	5		7	13
Cetacea	Whales			1					1
Enhydra lutris	Sea otter					10			10
UNIDENTIFIABLE MAMMALS		2	12	21	201	163	32	128	559
FISH:									
Merluccius productus	Pacific hake							2	2
Embiotocidae	Surfperches							2	2
Sebastes sp.	Rockfishes					2			2
Hexagrammos sp.	Greenlings							1	1
Ophiodon elongatus	Lingcod					1			1
Unidentified fish			1	2	4	10		6	23
BIRDS:									
Podicipedidae	Grebe							1	1
Phalacrocorax sp.	Cormorants				1	1		1	3
Anatidae	Duck					1		2	3
Uria aalge	Common murre					9		4	13
Cerorhinca monocerata	Rhinoceros auklet				1				1
Alcidae	Auks and relatives					2			2
Small bird	Robin-sized							1	1
Unidentified birds					1	3		9	13
UNIDENTIFIABLE BONE FRAGMENTS				35	189	230	2	236	692
TOTAL		2	15	59	410	445	40	465	1436

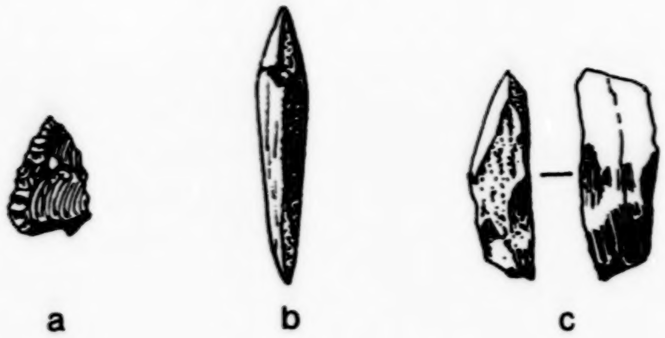


Figure 3-4. Artifacts from 1980 testing at 35LNC50 (shown actual size).

a. TPA-2-1 b. TPA-3-1 c. TPA-3-2

of only 11 items (Table 3-7). Stone artifacts included a small obsidian used flake (TPA-3-2; Figure 3-4a), a chert used flake (TPA-5-1), six pieces of chert debitage, and one piece of basalt debitage. Two bone artifacts were also found. A wedge-based bone point (TPA-3-1; Figure 3-4b) has dimensions of 3.6 cm in length, 0.6 cm in width, and 0.6 cm in thickness. Bone points of this type are generally interpreted to have served as arming points for composite toggling harpoon heads. The other bone artifact recovered is the tip fragment from a bone wedge (TPA-2-1; Figure 3-4c).

Table 3-7. Inventory of artifacts from 1980 testing at 35LNC50.

		Level Below Surface					
Artifact Class	Sod	1	2	3	4	5	Totals
Obsidian used flake				1			1
Chert used flake						1	1
Chert debitage	1	1	3		1		6
Basalt debitage	1						1
Bone point				1			1
Bone wedge			1				1
TOTAL	2	1	4	2	1	1	11

SUMMARY

Based on the limited testing carried out, 35LNC49 and 35LNC50 appear to have similar internal structures, as at both sites the shell midden consisted of two strata bracketed by sod and what was described as underlying sterile soil. Sea mussels and barnacles were reported to have been the most common marine shells comprising the middens, with clams also represented at both sites. Identification of the animal bones recovered indicates some differences in the animals hunted by the inhabitants of the two sites (discussed further in Chapter 7).

A single radiocarbon date of 1150 ± 50 BP (DIC-1758) was obtained from the radius of an adult Steller sea lion recovered from 40-50 cm below surface in Unit A at 35LNC50. This element came from a "thin but compacted stratum of mollusc shell, bone, charcoal, and fire-cracked rocks" (Richard E. Ross, personal communication). This description probably correlates with Stratum 3. No radiocarbon dates are available from 35LNC49. The single temporally-diagnostic artifact recovered, a small narrow-necked projectile point, could easily date within the same timespan indicated by the radiocarbon date from 35LNC50.

CHAPTER 4

THE 1988 EXCAVATIONS AT 35LNC50

Archaeological investigations at 35LNC50 in 1988 were confined to the portion of the site within the Yaquina Head Outstanding Natural Area. Two excavation techniques were employed during the fieldwork: (1) probe and auger testing, and (2) unit excavations. The two techniques were carried out concurrently, with the results of the probe and auger testing used to located the larger excavations units. The locations of the probes, auger holes, and excavation units are shown on the topographic site map (Figure 4-1). All excavations were backfilled at the conclusion of the fieldwork.

PROBE AND AUGER TESTING

The probe and auger testing was carried out in order to establish the boundary of that portion of the archaeological site on federal land. Thirteen 50 x 50 cm probes were dug; these were placed for the most part at 10 m intervals, with the interval between them reduced to 5 m in two instances (P5 and P7) in order to more precisely determine the midden boundary. The probe excavations began with P1 through P6 along the public/private property boundary, with P7 through P13 then placed to the south to determine the upslope limits of the midden (Figure 4-1). The probes were dug with shovels and trowels in arbitrary 10 cm levels, with the soil matrix passed through 3.35 mm (1/8-inch) mesh screen.

In order to insure that additional buried cultural deposits were not present, auger holes were excavated into the bottom of five probes. In addition, once the westward extent of the midden was established, four more auger holes were dug at 20 m intervals farther west along the public/private property boundary to determine if any other archaeological deposits (besides 35LNC50) were present in the vicinity of the proposed fenceline. All auger holes were excavated using a heavy-duty auger with a 25-cm bore, and the fill was again passed through 3.35 mm mesh screen. No evidence of prehistoric occupation was encountered in any of the auger hole excavations.

A summary of the probe excavation data (Table 4-1) indicates that the midden deposit extends from P1 at the northeast corner of federal property westward along the public/private boundary for slightly more than 30 m, ending somewhere between P4 and P5. The midden also extends upslope to the south for a distance of 20 m to P12. The densest

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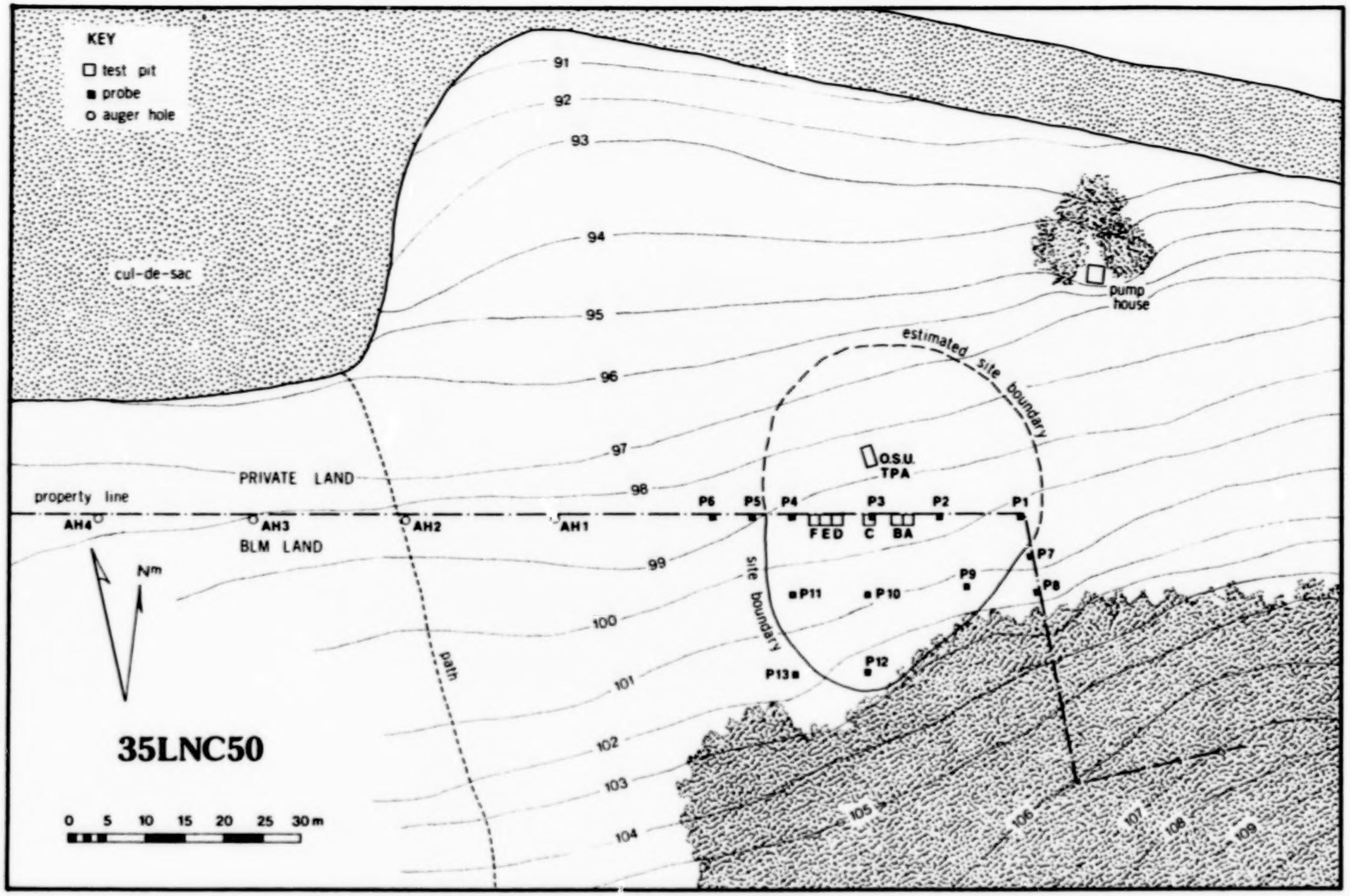

Figure 4-1. Topographic map of 35LNC50 showing locations of probes, excavation units, and approximate extent of midden.

Table 4-1. Summary of probe and auger excavations at 35LNC50.

Probe	Probe Depth	Auger Depth	Volume (m^3)*	Depth of Shell
P1	80 cm	130 cm	.20	10-30 cm
P2	60 cm	100 cm	.15	30 cm
P3	80 cm	100 cm	.20	50 cm
P4	60 cm		.15	Light to 30 cm
P5	50 cm		.125	None
P6	50 cm	100 cm	.125	None
P7	50 cm		.125	None
P8	50 cm		.125	None
P9	50 cm		.125	Trace at 10-20 cm
P10	70 cm	100 cm	.175	30 cm
P11	60 cm		.15	10-25 cm
P12	60 cm		.15	30 cm
P13	50 cm		.125	None

* Volume does not include additional amount excavated by auger.

occurrence of the cultural deposit was along the property boundary, with the shell layer reaching a depth of approximately 50 cm in P3.

It is possible to determine the approximate size of the shell midden at 35LNC50 by combining the results of the 1980 Oregon State University testing on private land with the archaeological investigations carried out on public land during this project. Overall, the shell deposit covers an area of approximately 45 m north-south by 40 m east-west. The results of both the 1980 testing and the more extensive 1988 excavations are in agreement that the shell midden averages about 30-40 cm over most of this area, reaching a maximum depth below surface of 60 cm in the center. Some artifacts and faunal remains were found just below the shell deposit, having been recovered at a maxium depth of 70-80 cm.

UNIT EXCAVATIONS

The unit excavations at 35LNC50 were carried out in 1 x 1 m squares. Vertical control was maintained through use of line levels attached to fixed stations, the elevations of which were correlated by means of the transit and stadia method. The cultural deposit was removed with shovels and trowels in arbitrary 10 cm levels, subdivided according to natural stratigraphy.

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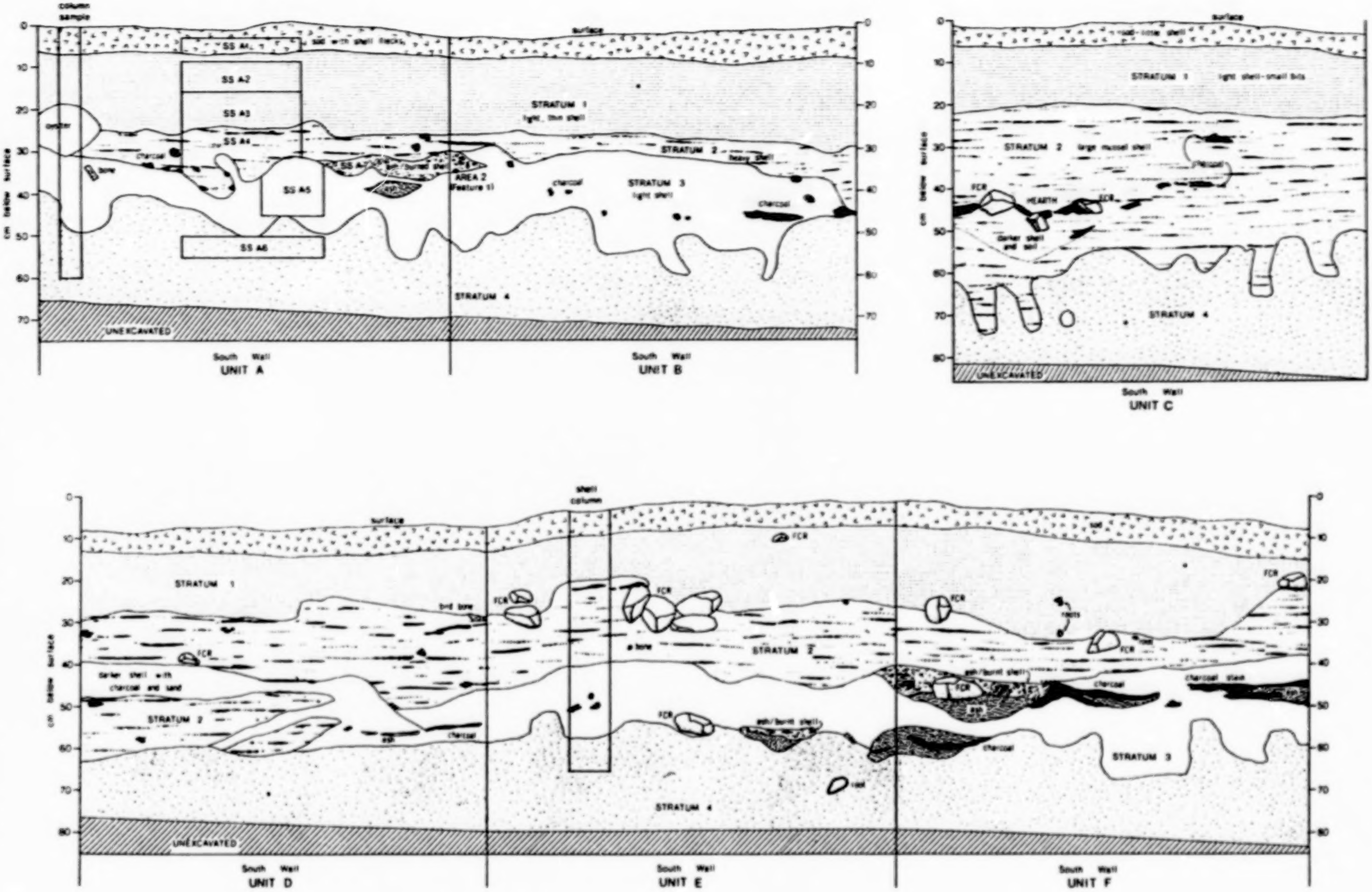

Figure 4-2. Profiles of excavation units at 35LNC50.

Artifacts encountered in situ were recorded on sketch maps on excavation forms prepared for each unit/level/stratum. Otherwise, recovery of cultural materials was accomplished by dry-screening the soil matrix through 3.35 mm mesh screen. All cultural materials recovered were bagged separately according to the unit, level, and stratum from which they originated.

In all, six 1 x 1 m excavation units were dug. All six were placed on federal land along the public/private property boundary where the site deposits appeared densest and where vegetation permitted. Units A and B were aligned together to form a 1 x 2 m unit between P2 and P3. Unit C was placed over and incorporated P3. Units D, E, and F were aligned together to form a 1 x 3 m unit between P3 and P4. All units were dug to the limit of the cultural deposit, with a total volume of 4.4 m^3 of fill removed during the unit excavations.

STRATIGRAPHY

Four basic strata were recognized during the archaeological investigations at 35LNC50 (Figure 4-2). As designated in the field, these were Stratum 1, a shelly sandy loam; Stratum 2, a dense shell layer within a matrix of sandy loam; Stratum 3, shelly loam underlying the dense shell layer; and Stratum 4, sandy loam largely lacking in shell and other cultural debris underlying the cultural deposit. The four strata do not occur continuously across the site. In particular, Stratum 3 is not present in Unit C; its abrupt diminution can be seen in neighboring Unit B (Figure 4-2).

A soil profile in the south wall of Units A and B was described by Patricia F. McDowell during the course of her geomorphic investigations and is summarized in Table 4-2.

CULTURAL FEATURES

Five discrete cultural features were encountered and recorded during the excavations at 35LNC50. All consist of clusters of fire-cracked rocks which appear to represent hearths, and all were associated with the dense shell layer designated Stratum 2. Information on these features is summarized in Table 4-3, with more detailed descriptions presented below.

Feature 1 was a hearth composed of fire-cracked rocks found at a depth of 30-40 cm in Unit A (Figure 4-3). This feature occupied a 70 by 100 cm area on the north side of Unit A and clearly extended farther north outside the excavated area. A total of 48 pounds of rock was removed from this cluster. Charcoal collected from among the fire-cracked rocks yielded a radiocarbon date of 600 ± 50 BP (Beta-29239).

Table 4-2. Soil profile description of south wall of units A and B.

Stratum	Depth	Description
0	0-6 cm	Sod layer; loam; organic-rich; moderate, medium to coarse granular structure; slightly hard dry consistence; many fine roots; abrupt, smooth lower boundary.
1A	6-15 cm	Shelly sandy loam; black (10YR 2/1) when moist, very dark grayish brown (10YR 3/2) when dry; organic-rich; moderate, medium to coarse granular structure; slightly hard dry consistence; gravel-size particles (>2 mm) are all shell; sand-size particles (2mm-0.0625 mm) are approximately 70% or more shell; some fine roots; neutral (pH 6.65); no stratigraphic boundary at 15cm; Soil Sample A-2.
1B	15-25 cm	Shelly loam; black (10YR 2/1) when moist, very dark grayish brown (10YR 3/2) when dry; organic-rich; moderate, medium to coarse granular structure; slightly hard dry consistence; gravel-size particles (>2 mm) are all shell; sand-size particles (2mm-0.0625 mm) are approximately 70% or more shell; some fine roots; moderately alkaline (pH 7.95); clear, smooth lower boundary; Soil Sample A-3.
2	25-35 cm	Clast-supported shell layer with matrix of sandy loam; black (10YR 2/1) when moist, very dark gray (10YR 3/1) when dry; organic-rich; no pedogenic structure; slightly hard dry consistence; gravel-size particles (>2 mm) are all shell; sand-size particles (2mm-0.0625 mm) are approximately 70% or more shell; moderately alkaline (pH 7.9); abrupt, wavy lower boundary; Soil Sample A-4.
3	35-55 cm	Shelly loam; black (10YR 2/1) when moist, very dark gray (10YR 3/1) when dry; organic-rich; very weak, fine granular structure; soft dry consistence; gravel-size particles (>2 mm) are all shell; sand-size particles (2mm-0.0625 mm) are approximately 70% or more shell; some fine roots; mildly alkaline (pH 7.6); abrupt, wavy lower boundary; Soil Sample A-5.
4A	55-67+ cm	Sandy loam; black (10YR 2/1) when moist, very dark brown (10YR 2/2) when dry; organic-rich; moderate, medium to coarse subangular blocky, breaking to strong, fine granular; soft dry consistence; few

Table 4-2 (continued)

Stratum	Depth	Description
		very fine (1-2 mm) shell fragments; few fine (1-3 mm) orange inclusions (bisque?); sand-size particles are about 80% rock fragments, 20% shell fragments; some fine roots; neutral (pH 7.3); Soil Sample A-6.
4B*	240-250 cm	Subsoil of Stratum 4; sandy loam; dark yellowish brown (10YR 3/4) when moist, yellowish brown (10YR 5/4) when dry; sand-size particles are dominated by rock fragments and glassy tephra, with less than 10% shell; mildly alkaline (pH 7.5); Soil Sample C-2.

* Documented in auger hole in bottom of Unit C.

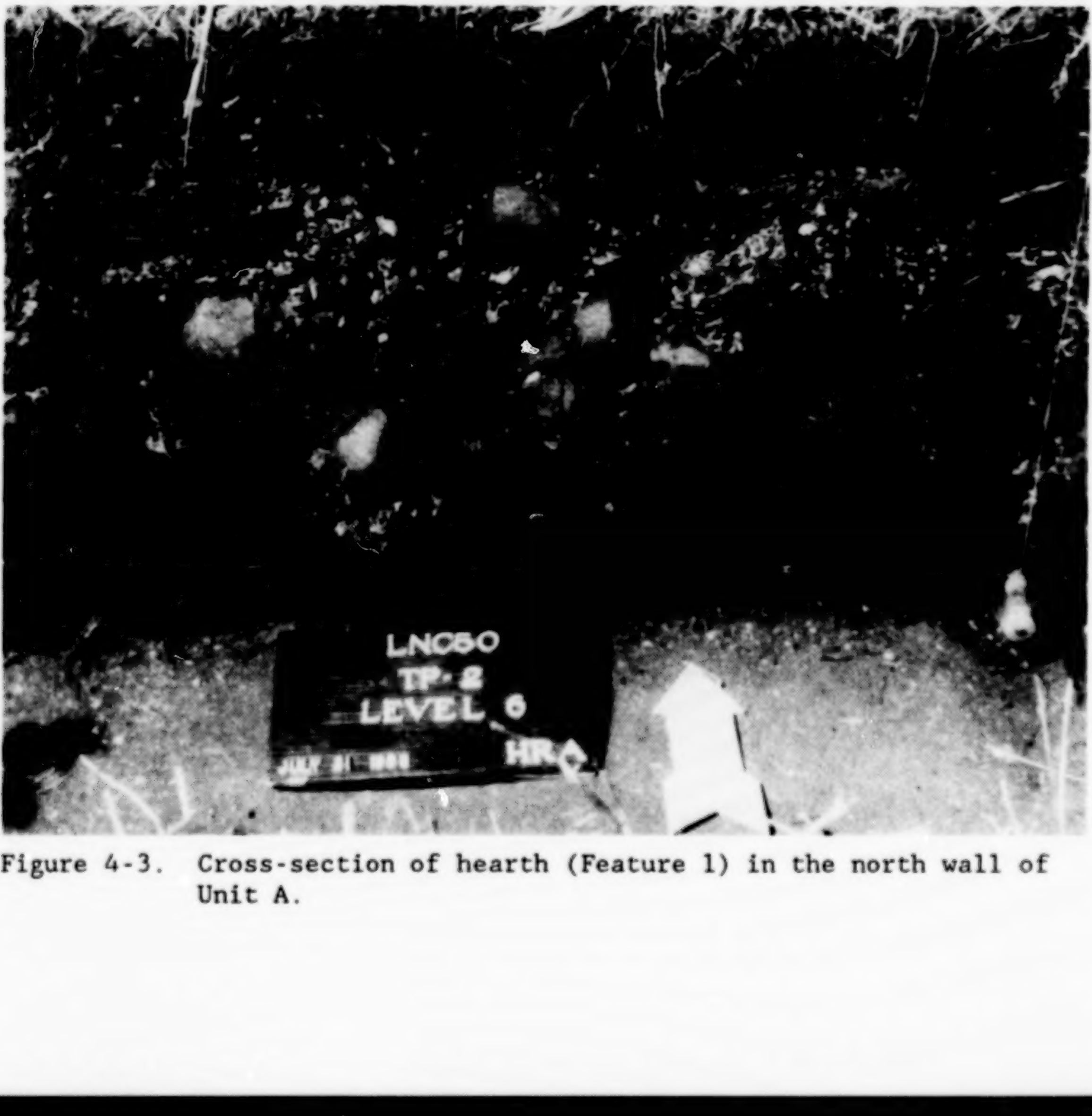

Figure 4-3. Cross-section of hearth (Feature 1) in the north wall of Unit A.

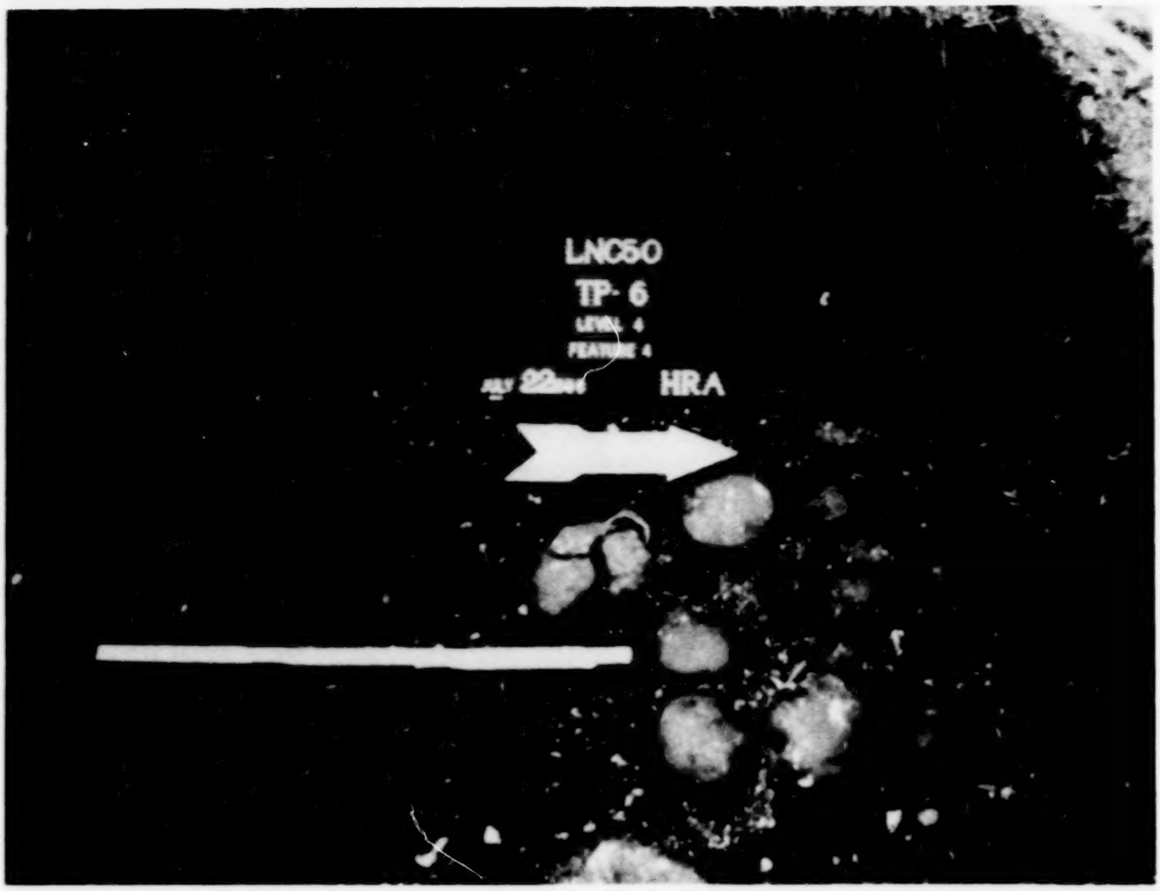

Figure 4-4. View of rock hearth (Feature 4) in Level 4 of Unit F.

Two sandstone abraders were found in direct association with this feature.

Feature 2 was a rock hearth encountered at a depth of 22-30 cm along the south edge of Unit E. It occupied a 20 by 40 cm area and extended into the south wall of the unit. A heavy concentration of shell from Stratum 2 surrounds and underlies the rocks. A total of 18 pounds of rock was removed from this cluster. A radiocarbon date of 550 ± 50 BP (Beta-29238) was obtained from charcoal recovered from the level (10-20 cm) in Stratum 1 immediately above this feature.

Feature 3 was a hearth of fire-cracked rock found at a depth of 40-60 cm in the west portion of Unit D and the east portion of Unit E. Altogether, this feature occupied an area of about 120 cm by 70 cm and included about 40 pounds of rock. The east wall profile clearly shows a dense layer of shell from Stratum 2 situated within a rock-lined pit. A radiocarbon date of 940 ± 50 BP (Beta-29240) was obtained from charcoal collected from this feature.

Table 4-3. Summary of cultural features at 35LNC50.

Feature	Unit	Depth Below Surface	Stratum	Description/Associations
1	A	30-40 cm	2	Fire-cracked rock hearth; two sandstone abraders, C-14 date of 600 ± 50 BP
2	E	22-30 cm	2	Fire-cracked rock hearth; C-14 date of 550 ± 50 BP obtained from just above this feature
3	D-E	40-60 cm	2	Fire-cracked rocks in pit; C-14 date of 940 ± 50 BP
4	F	25-45 cm	2	Fire-cracked rock hearth; C-14 date of 830 ± 60 BP
5	D	40-50 cm	2	Fire-cracked rocks in pit

Feature 4 was a fire-cracked rock hearth found at a depth of 25-45 cm in the northeast portion of Unit F (Figure 4-4). This feature measured 50 by 45 cm and contained a total of 36 pounds of rock. Charcoal collected from the lower level of this feature yielded a radiocarbon date of 830 ± 60 BP (Beta-30525).

Feature 5 was a hearth of fire-cracked rocks found at a depth of 40-50 cm in the southeast portion of Unit D. It occupied a 36 by 30 cm area and extended into the east wall of this unit. The wall profile clearly indicates that the rocks were lying within a pit lined with charcoal.

ARTIFACTS

The artifacts recovered from 35LNC50 include objects made from stone, bone/antler, and shell. These artifacts were catalogued using a system that indicates in which unit and 10 cm level each specimen was recovered. According to this system, the unit designation is followed first by the level number, and then by a serial number which consecutively records each artifact within that particular unit and level. Thus, scraper E-2-1 was the first artifact from Level 2 in Unit E, while flake knife P3-1-1 was the first artifact from Level 1 in Probe 3. The classes of artifacts represented, their frequency, and their

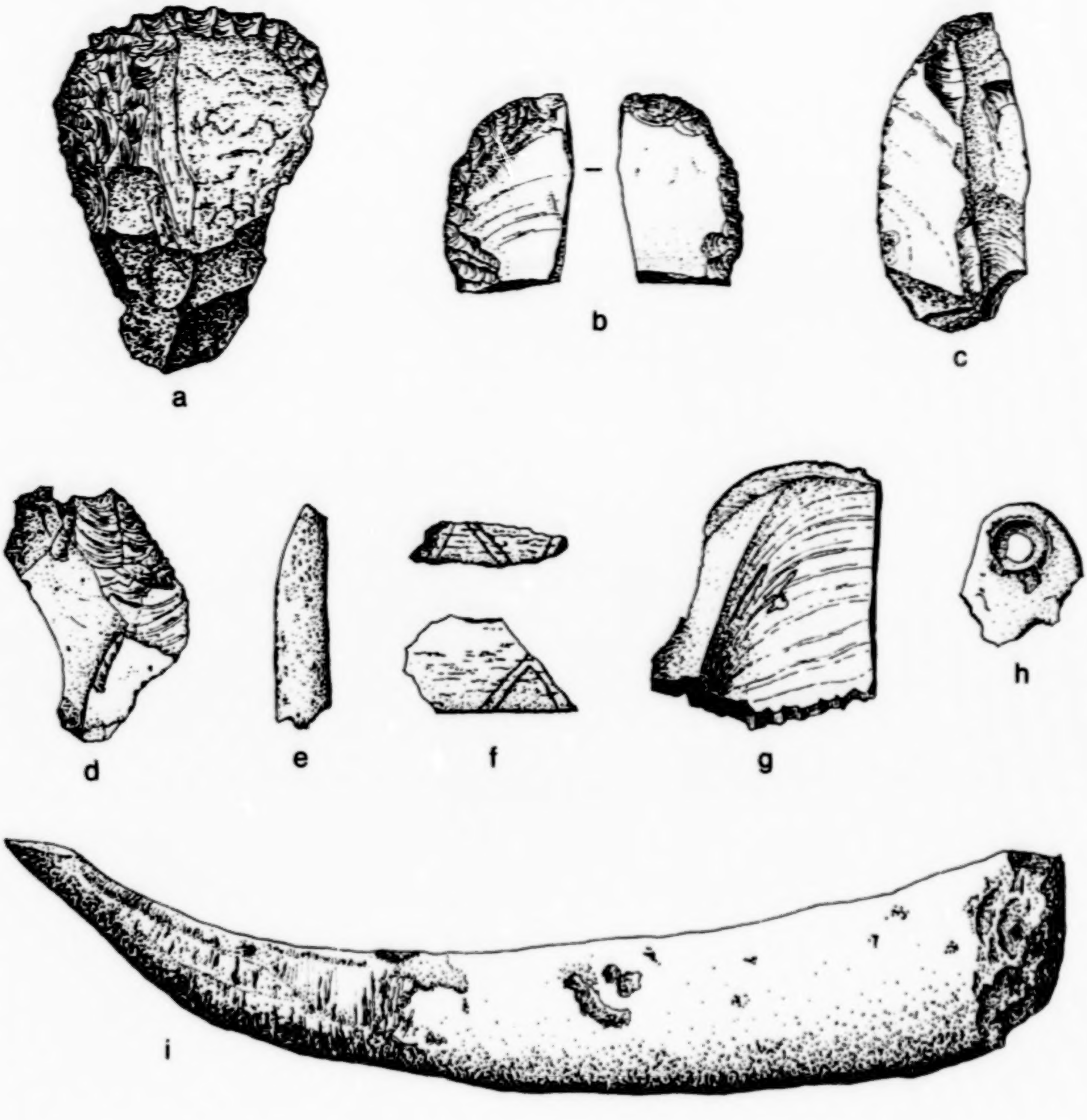

Figure 4-5. Flaked stone, bone and shell artifacts from 35LNC50: a, scraper; b, flake knife; c, used flake; d, bipolar core; e, bone awl; f, decorated bone; g, clamshell knife fragment; h, shell pendant fragment; i, antler wedge (shown actual size).

a. E-2-1
b. P3-1-1
c. P3-1-2
d. C-4-1
e. D-2-1
f. E-2-2/3
g. A-4-3
h. C-5-1
i. E-4-1

distribution in terms of level below surface are summarized in Table 4-4.

Artifacts recovered from 35LNC50 during the 1988 excavations include 201 items. Chipped stone tools include a scraper, flake knife, used flake, bipolar core fragment, and 187 pieces of lithic debitage.

The chert scraper is a well-made specimen distinguished by steep-angled unifacial retouch along the end and one side (Figure 4-5a). It measures 5.5 cm long, 4.0 cm wide, and 1.1 cm thick.

Table 4-4. Artifact inventory from 1988 excavations at 35LNC50.

	Level Below Surface								
Artifact Class	1	2	3	4	5	6	7	8	Totals
Flake Tool Series									
Scraper		1							1
Flake Knife			1						1
Used Flake				1					1
Core/Debitage Series									
Core Fragment			1						1
Chert Debitage	33	43	32	31	27	12	1	1	180
Basalt Debitage					6				6
Obsidian Debitage		1							1
Abrader Series									
Abraders			1	2					3
Bone/Antler Series									
Antler Wedge				1					1
Bone Awl		1							1
Decorated Bone		2							2
Shell Series									
Shell Knife				1					1
Shell Pendant					1				1
Fossilized Shell	1								1
TOTALS	34	48	35	36	34	12	1	1	201

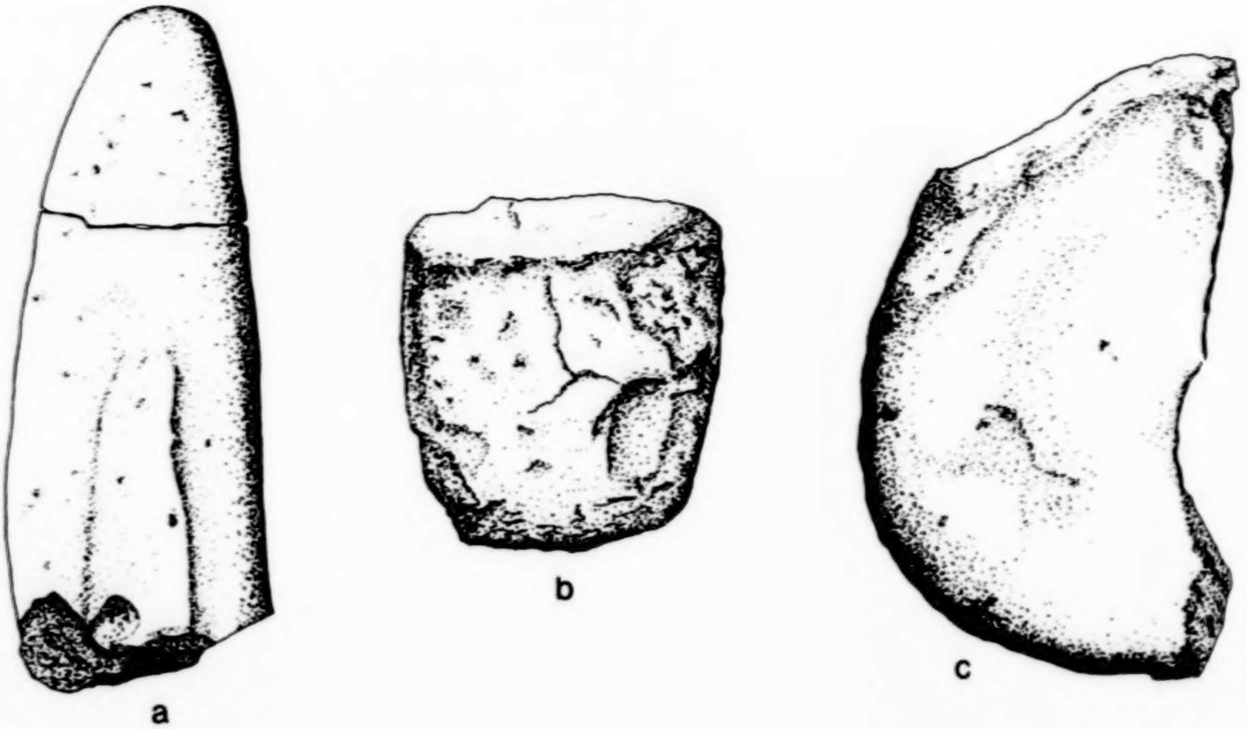

Figure 4-6. Abraders from 35LNC50 (shown approximately 75% actual size).

a. A-4-1 b. A-4-2 c. B-3-1.

The chert flake knife is a fragmentary flake featuring low-angled bifacial retouch along its margins (Figure 4-5b). The used flake is a chert interior flake exhibiting indications of use along one convex edge as a casual cutting or scraping tool (Figure 4-5c).

The core is a fragment of a chert cobble showing evidence of battering at opposite ends characteristic of bipolar reduction (Figure 4-5d). It measures 4.5 cm in length, giving a rough indication of the size of the cobbles selected for reduction at this site by the native inhabitants.

A total of 187 pieces of lithic debitage or waste flakes produced as a result of flaked stone tool manufacture were recovered from 35LNC50 in 1988. Of these, 180 (96.3%) are chert, six (3.2%) are basalt, and one is obsidian (0.5%). For descriptive purposes, each piece of debitage was classified in three ways: (1) in terms of the debitage categories recognized by Sullivan and Rozen (1985); (2) by presence or absence of cortex; and (3) according to size classes. The

Table 4-5. Lithic debitage by raw material and debitage class.

		Level Below Surface								
Flake Type		1	2	3	4	5	6	7	8	Totals
Chert:	Complete	19	14	10	20	11	8	1		83
	Broken	2	4	4		1				11
	Fragment	6	16	8	8	12	3			53
	Debris	6	9	10	3	3	1		1	33
Basalt:	Complete					5				5
	Fragment					1				1
Obsidian:	Complete		1							1
	TOTAL	33	44	32	31	33	12	1	1	187

resulting descriptive data on the lithic debitage recovered from 35LNC50 in 1988 is summarized in Tables 4-5 to 4-7.

The three abraders recovered are all of sandstone. The most noteworthy specimen, recovered in two fragments, has been shaped entirely and tapers to a rounded tip (Figure 4-6a). A second abrader

Table 4-6. Presence/absence of cortex on lithic debitage.

		Level Below Surface								
Flake Type		1	2	3	4	5	6	7	8	Totals
Chert:	Cortex	4	14	9	16	10	5			58
	Non-Cortex	29	29	23	15	17	7	1	1	122
Basalt:	Cortex					2				2
	Non-Cortex					4				4
Obsidian:	Non-Cortex		1							1
	TOTAL	33	44	32	31	33	12	1	1	187

Table 4-7. Tabulation of lithic debitage by raw material and size classes.

		Level Below Surface								
Flake Size (mm)		1	2	3	4	5	6	7	8	Totals
Chert:	<10	5	3			1				9
	10-20	13	14	7	8	4	4		1	51
	20-30	9	13	8	6	10	2	1		49
	30-40	3	7	9	10	6	2			37
	40-50	2	2	6	2	3	3			18
	>50	2	4	2	5	3	1			16
Basalt:	20-30					1				1
	30-40					1				1
	40-50					1				1
	>50					3				3
Obsidian:	10-20		1							1
	TOTAL	34	44	32	31	33	12	1	1	187

is a fragmentary piece of sandstone that has been shaped along the edge and has a flat surface worn from use (Figure 4-6c). The third abrader is simply a blocky piece of sandstone with one flat facet (Figure 4-6b).

Bone/antler tools include a wedge, an awl, and two pieces of decorated bone. The wedge consists of an antler tine that has been modified at the tip (Figure 4-5i). It measures 13.7 cm in length, 3.0 cm in circumference at the base, and has a bit width of 1.0 cm. The awl is a short (3.4 cm) piece of bone with a rounded and pointed tip (Figure 4-5e). The two pieces of decorated bone were both found in Level 2 (10-20 cm below surface) in Unit E and appear to be from the same object. Both are flat bone fragments with straight incised lines (Figure 4-5f).

Shell artifacts include a fragment of a clamshell knife, a pendant fragment, and a fossilized clam. The clamshell knife fragment is a thick (3-5 mm) piece of shell featuring a sharp, rounded edge (Figure 4-5g). The pendant fragment consists of the portion of the pendant bearing the hole used for attachment (Figure 4-5h). The fossilized shell is a butter clam (*Saxidomus giganteus*); this item was presumably carried to the site by the native inhabitants.

RADIOCARBON DATING

Seven radiocarbon dates are available from 35LNC50. A single date of 1150 ± 50 BP (DIC-1758) was obtained from a Steller sea lion radius recovered during the Oregon State University test excavations in 1980 (Richard E. Ross, personal communication). The remaining six dates, obtained as a result of the 1988 excavations, are all based on charcoal. One date was obtained from Stratum 1, three dates from Stratum 2, two dates from Stratum 3, and one date from Stratum 4. Information on the provenience and associations of these dates is summarized in Table 4-8. The dates occur in correct stratigraphic order, and indicate occupation of 35LNC50 between approximately 1400 and 550 radiocarbon years ago.

Table 4-8. Summary of radiocarbon dates from 35LNC50.

Stratum	Unit	Depth Below Surface (cm)	Date BP	Laboratory Number	Association
1	E	10-20	550 ± 50	Beta-29238	Above rock hearth (Feature 2)
2	A	36-40	600 ± 50	Beta-29239	Rock hearth (Feature 1)
2	F	40-50	830 ± 60	Beta-30525	Rock hearth (Feature 4)
2	E	50-60	940 ± 50	Beta-29240	Rock hearth (Feature 3)
OSU-3	OSU-A	40-50	1150 ± 50	DIC-1758	Adult Steller sea lion radius
3	C	60-70	1160 ± 80	Beta-30526	Near bottom of shell deposit
4	D&E	70-80	1390 ± 80	Beta-29241	Below shell deposit

CHAPTER 5

MIDDEN ANALYSIS

by Debra C. Barner

During the fieldwork at 35LNC50 it was apparent that the midden was composed predominantly of sea mussel (*Mytilus californianus*). In order to determine the range of other molluscan species present, two methods of sampling the midden deposit were employed. First, measured "column samples" were removed from two locations within the midden for the specific purpose of conducting midden analysis. Second, "grab samples" of molluscan species were collected during the excavations. Although this method is clearly not as rigorous as the analysis of column samples, it is more likely to ensure the reporting of molluscan species that are present at the site, but missing by chance in the column samples. A comparative collection and several keys (Morris 1966; Cornwall 1975; Griffith 1975; Keep 1935; Quayle 1978) were used in the identification of the molluscan species found at 35LNC50.

COLUMN SAMPLE ANALYSIS

Standard procedures for midden analysis were followed in analyzing the column samples (e.g. Meighan et al. 1958; Hester and Conover 1970). The column samples measured 10 cm by 10 cm and were removed in 10 cm levels. The samples were dried and then passed through 6.3 mm (1/4-inch) and 3.35 mm (1/8-inch) screens. The contents of the screens were sorted into the major component categories of molluscan species, bone, charcoal, rock, cultural material, and residue (Table 5-1). The material represented in the residue was too small to permit accurate sorting and was not further analyzed. Previous midden analyses have shown that the time spent in the lab sorting shell increases exponentially with the decrease in screen size (Koloseike 1968). After sorting, the midden components were weighed to 0.1 gram accuracy.

The column samples selected for analysis were taken from Units A and E. A third column sample, from the east wall of Unit C, has been submitted for curation and is available for future analysis. All of the column samples encompassed the full extent of the midden. Twelve different species of marine shellfish were represented in Column A. These species and their sample weights are listed in Table 5-2. Sea mussel comprises 88.4% of the marine shellfish in Column A. The second most frequent species, horse barnacle (*Balanus cariosus*), comprises

Table 5-1. Weight (in grams) of midden components in column samples.

	Level Below Surface						
Component	1	2	3	4	5	6	Total
Column A							
Marine shellfish	9.2	194.2	475.7	419.1	224.7	5.3	1328.3
Land snails	0.1	0.1	0.2	---	---	---	0.4
Bone	---	3.8	0.3	27.7	---	0.8	32.6
Cultural	---	---	---	---	---	---	---
Roots	13.5	0.9	0.6	0.8	0.6	---	16.4
Rock	57.7	9.2	4.5	3.9	0.5	---	75.8
Charcoal	---	1.6	1.6	3.6	0.5	0.2	7.5
Residue	445.9	751.4	778.8	805.9	638.6	746.8	4167.4
TOTAL	526.4	961.2	1261.7	1261.0	864.9	753.1	5628.3
Column E							
Marine shellfish	44.2	459.6	845.7	833.1	594.2	128.7	2905.5
Land snails	0.3	---	0.1	---	---	---	0.4
Bone	0.1	0.6	0.3	0.3	0.6	0.1	2.0
Cultural	9.1	---	0.2	0.2	0.1	---	9.6
Roots	9.9	0.4	---	0.1	0.3	0.1	10.8
Rock	6.5	16.2	4.4	2.3	11.4	2.2	43.0
Charcoal	---	0.9	2.1	3.2	3.9	1.3	11.4
Residue	554.7	842.7	657.5	646.3	610.4	710.9	4022.5
TOTAL	624.8	1320.4	1510.3	1485.5	1220.9	843.3	7005.2

6.0%. Littleneck clam is the next most common species at 2.5%. These three species comprise nearly 97% of the shell in the column sample. None of the remaining species represent more than 1% of the marine shellfish in this sample.

Eighteen species of marine shellfish were identified in Column E (Table 5-3). Sea mussel at 91.1% and horse barnacle at 4.9% represent 96% of the sample, while none of the remaining species constitute over 1% of the sample.

GRAB SAMPLE ANALYSIS

During the excavations, all potentially identifiable shell other

Table 5-2. Weight (in grams) and percent of shellfish components from Column A.

	Level Below Surface						
Shell Component	1	2	3	4	5	6	Total
BIVALVES:							
Clinocardium nuttalli cockle	---	0.1 0.05%	---	---	0.3 0.13%	---	0.4 0.03%
Mytilus californianus sea mussel	7.3 79.35%	167.0 85.99%	403.0 84.72%	396.3 94.56%	195.5 87.00%	4.5 84.91%	1173.6 88.36%
Penitella penita piddock	---	1.6 0.82%	0.7 0.15%	0.3 0.07%	---	---	2.6 0.20%
Protothaca staminea littleneck clam	0.4 4.35%	1.7 0.88%	2.9 0.61%	8.8 2.10%	18.4 8.19%	0.5 9.43%	32.7 2.46%
UNIVALVES:							
Acmaea digitalis fingered limpet	---	---	0.2 0.04%	---	---	---	0.2 0.02%
A. pelta shield limpet	---	0.2 0.10%	0.3 0.06%	0.1 0.02%	---	---	0.6 0.05%
Monadenia fidelis * banded forest snail	---	0.1 0.05%	0.2 0.04%	---	---	---	0.3 0.02%
Selenites sp.* selens	0.1 1.08%	---	---	---	---	---	0.1 0.01%
OTHERS:							
Balanus balanus sharp acorn barnacle	---	---	9.3 1.96%	---	---	---	9.3 0.70%
B. carious horse barnacle	---	14.2 7.31%	47.2 9.92%	9.4 2.24%	8.7 3.87%	0.3 5.66%	79.8 6.01%
Cryptochiton stelleri gumboot chiton	---	---	2.8 0.59%	---	---	---	2.8 0.21%
Katharina tunicata black katy chiton	0.6 6.52%	6.4 3.30%	1.7 0.36%	1.7 0.41%	---	---	10.4 0.78%
Mitella polymerus goose barnacle	---	0.9 0.46%	5.9 1.24%	1.5 0.36%	1.8 0.80%	---	10.1 0.78%
Mopalia muscosa mossy chiton	---	---	0.1 0.02%	---	---	---	0.1 0.01%
Unidentifiable	0.9 9.78%	2.1 1.08%	1.6 0.34%	1.0 0.24%	---	---	5.6 0.42%
TOTAL MARINE SHELLFISH	9.2	194.2	475.7	419.1	224.7	5.3	1328.2

* land snails not included in totals

Table 5-3. Weight (in grams) and percent of shellfish components from Column E.

	Level Below Surface						
Shell component	1	2	3	4	5	6	Total
BIVALVES:							
Clinocardium nuttalli cockle	---	---	---	---	---	0.1 0.08%	0.1 0.00%
Hiatella gallicana Gallic saxicave	---	---	---	---	0.1 0.02%	---	0.1 0.00%
Mytilus californianus sea mussel	30.4 68.78%	383.8 83.51%	795.1 94.02%	783.1 94.00%	534.4 89.94%	119.3 92.70%	2646.1 91.07%
Penitella penita piddock	---	0.8 0.17%	---	---	0.2 0.03%	---	1.0 0.03%
Protothaca staminea littleneck clam	1.8 4.07%	3.4 0.74%	0.4 0.05%	10.8 1.30%	3.6 0.61%	0.4 0.31%	20.4 0.70%
Saxidomus giganteus butter clam	---	0.5 0.11%	---	6.4 0.77%	2.1 0.35%	---	9.0 0.31%
UNIVALVES:							
Acmaea digitalis fingered limpets	---	0.1 0.02%	0.1 0.01%	---	---	---	0.2 0.01%
A. pelta shield limpet	---	0.3 0.07%	0.4 0.05%	0.2 0.02%	0.4 0.07%	0.1 0.08%	1.4 0.05%
Diodora aspera keyhole limpet	---	0.1 0.02%	---	---	---	---	0.1 0.00%
Monadenia fidelis * banded forest snail	---	---	0.1	---	---	---	0.1
Nucella emarginata rock dwelling purple	0.6 1.36%	1.9 0.41%	0.3 0.04%	---	0.7 0.12%	---	3.5 0.12%
N. lamellosa wrinkled purple	4.1 9.28%	2.5 0.54%	---	1.8 0.22%	---	---	8.4 0.29%
N. lima rough purple	---	0.9 0.20%	0.4 0.05%	---	---	---	1.3 0.04%
Selenites sp. * selens	0.3	---	---	---	---	---	0.3
OTHERS:							
Balanus balanus sharp acorn barnacle	---	---	---	0.2 0.02%	0.3 0.05%	---	0.5 0.02%
B. cariosus horse barnacle	5.3 11.99%	50.7 11.03%	28.1 3.32%	8.5 1.02%	43.4 7.30%	7.2 5.59%	143.2 4.93%
Cryptochiton stelleri gumboot chiton	0.5 1.13%	---	1.6 0.19%	13.8 1.66%	---	---	15.9 0.55%
Katharina tunicata black katy chiton	0.6 1.36%	8.4 1.83%	9.0 1.06%	2.5 0.30%	2.3 0.39%	0.3 0.23%	23.1 0.80%

Table 5-3 (continued)

	Level Below Surface						
Shell component	1	2	3	4	5	6	Total
Mitella polymerus goose barnacle	0.5 1.13%	4.3 0.94%	10.0 1.18%	5.4 0.65%	6.5 1.09%	1.2 0.93%	27.9 0.96%
Strongylocentrotus sp. sea urchin	---	---	---	---	0.1 0.02%	---	0.1 0.00%
Unidentifiable	0.4 0.90%	1.9 0.41%	0.3 0.04%	0.4 0.05%	0.1 0.02%	0.1 0.08%	3.2 0.11%
TOTAL MARINE SHELLFISH	44.2	459.6	845.7	833.1	594.2	128.7	2905.5

* land snails not included in totals

than sea mussel was collected from the screens. The molluscan remains recovered in this manner are identified in Table 5-4. Twenty-six marine species were collected, eight of which were not represented in the column samples. These eight marine species include Pacific razor clam (*Siliqua patula*), gaper clam (*Tresus capax*), thin-shelled littleneck (*Venerupis tenerrima*), whitecap limpet (*Acmae mitra*), blue top (*Calliostoma ligatum*), white slipper shell (*Crepidula nummaria*), lean nassa (*Nassarius mendicus*), and channeled dogwinkle (*Nucella canaliculata*). In contrast, sea urchin (*Strongylocentrotus* sp.) was the only marine species found in the column samples that was not also represented in the grab samples. Also represented in the grab samples were three species of land-dwelling snails, Townsend's snail (*Polygyra townsendiana*), banded forest snail (*Monadenia fidelis*), and a species of Selen (*Selenites* sp.), as well as one freshwater snail, Nuttall's flood snail (*Flumicola nuttalliana*).

In Table 5-4 an attempt has been made to quantify the frequency of shellfish species by means of the number of levels in which they were found. It should be noted that butter clam and cockle (*Clinocardium nuttalli*), although uncommon in the column samples, were well represented in the grab samples. Also worthy of note in the grab samples is the occurrence of horse clam (*Tresus capax*), absent in the column samples.

MOLLUSC AVAILABILITY

The intertidal area near Yaquina Head is composed of large basalt outcrops and boulders, with small basalt cobbles making up the beach gravel. This type of open coastal environment is ideal for sea mussel

Table 5-4. Shellfish represented in grab samples.

Species	Level Below Surface								Number of Unit/Levels Represented
	1	2	3	4	5	6	7	8	
BIVALVES:									
Clinocardium nuttalli	3	2	-	3	3	1	-	-	12
Hiatella gallicana	-	1	-	-	-	-	-	-	1
Mytilus californianus	8	9	14	11	9	6	3	1	61
Penitella penita	1	5	4	2	-	-	-	-	12
Protothaca staminea	8	8	10	8	8	6	-	1	49
Saxidomus giganteus	3	7	6	7	3	2	-	-	28
Siliqua patula	-	1	-	-	-	-	-	-	1 **
Tresus capax	-	3	2	-	-	-	-	-	5 **
Venerupis tenerrima	-	-	-	-	1	-	-	-	1 **
UNIVALVES:									
Acmaea digitalis	2	3	4	2	1	1	-	-	13
A. mitra	-	-	1	-	-	-	-	-	1 **
A. pelta	3	4	7	7	6	2	-	-	29
Calliostoma ligatum	-	1	-	-	-	-	-	-	1 **
Crepidula nummaria	-	-	-	-	1	-	-	-	1 **
Diodora aspera	-	1	-	1	-	-	-	-	2
Flumicola nuttalliana *	-	-	1	-	-	-	-	-	1
Monadenia fidelis *	1	-	3	-	-	-	-	-	4
Nassarius mendicus	-	-	-	1	-	-	1	-	2 **
Nucella canaliculata	-	-	-	1	-	-	-	-	1 **
N. emarginata	5	8	7	8	8	4	-	-	40
N. lamellosa	9	10	8	5	2	1	-	-	35
N. lima	6	7	10	7	7	3	1	-	41
Polygyra townsendiana *	-	-	2	1	-	-	-	-	3
Selenites sp. *	4	3	9	4	4	2	-	-	26
OTHERS:									
Balanus balanus	2	5	3	1	1	-	-	-	12
B. cariosus	6	10	11	9	7	6	2	-	51
Cryptochiton stelleri	5	8	7	5	3	1	-	-	29
Katharina tunicata	10	14	13	12	8	6	3	-	66
Mitella polymerus	1	4	5	2	3	4	1	-	20
Mopalia muscosa	-	-	1	-	-	-	-	-	1
Unidentified	1	1	-	2	-	-	-	-	4

* land-dwelling and freshwater species

** marine species not identified in column samples and horse barnacle, a situation that is reflected in the results of the midden analysis.

Sea mussel is the most common species represented at 35LNC50. It inhabits the middle intertidal zone and could have been collected at low tides throughout the year. It is large, up to 25 cm in length, with a solid shell that could have been used for utensils (Barnett 1937:168). It attaches itself to rocks by means of byssal threads. The threads intertwine, making it easy to collect the mussels in mass rather than individually. When collecting sea mussels in this way, smaller species may be collected inadvertently, which may account for much of the variety of other species represented.

Horse barnacle, the second most common species, is normally found in a lower intertidal zone than sea mussel, but it often overlaps into the mussel's range. This barnacle does not have a calcareous base and would therefore be difficult to collect off the rocks without damaging the meat. If it was gathered as a hitchhiker along with sea mussel, however, it could have been procured without damage.

Littleneck clam, butter clam, cockle, and horse clam were all identified in the samples. Littleneck clam was identified on a more regular basis than the other species. These clams prefer the calm waters of bays and estuaries, but can also be found on the protected outer coast. Littleneck clam could have been collected throughout the year during medium-low tides. Butter clam occurs somewhat lower in the intertidal zone but overlaps enough with littleneck so that they can often be collected together. Horse clam is found low in the intertidal zone and is deeply buried. Unlike the clams, cockle can be found on the surface of eelgrass flats in mud or sand. Reports to the Oregon Department of Fish and Wildlife on collections made by biology classes at Yaquina Head list all of these species except horse clam (Oregon Department of Fish and Wildlife 1987). The quantities found in the midden are limited, especially butter clam. Because they have stout, bowl-shaped shells, horse clam, butter clam, littleneck clam, and cockle may also have been collected for use as spoons, ladles, and containers (Barnett 1937:168).

Unlike the clams and cockle, which dig in sand or mud, piddock (*Penitella penita*) can bore into rock that is extremely hard (Ricketts and Calvin 1968:274), making it difficult to collect. This may account for its scarcity in the midden. Piddock inhabits the lower-middle intertidal zones and could have been collected during low tides throughout the year.

Goose barnacle (*Mitella polymerus*) was found on a regular basis throughout the samples. Since goose barnacle inhabits the middle intertidal zones, it would have been easily accessible throughout the year. Native peoples sometimes built fires over barnacles, roasted them in place on the rocks, and consumed them on the spot (Harrington 1943; Greengo 1952:72). If this was a common practice, it would result in an underestimation of the extent to which goose barnacle was used as food.

Three species of chiton were identified. Black katy chiton (*Katharina tunicata*) was found on a regular basis throughout the samples. It inhabits the lower-middle intertidal zone and can occasionally be found with sea mussel. It attains an edible size and was probably used as food. It does not retreat to shady areas during the daylight hours as most other chitons do, making it easy prey (Wesson 1982). Gumboot chiton (*Cryptochiton stelleri*) was also found on a regular basis in the samples. It is large and inhabits the lower intertidal zone, making it difficult to procure. Mossy chiton (*Mopalia muscosa*) was found in two samples. It inhabits the same zone as sea mussel and is small in size. It is doubtful that it was used as food as the other two chitons probably were.

Sharp acorn barnacle (*Balanus balanus*) inhabits the rocky outer coast in the lowermost intertidal zones. This barnacle could only be collected during very low tides which presumably accounts for its relative scarcity.

Most of the snails and limpets are small. Since they inhabit the same or overlapping intertidal areas with sea mussel, they probably hitchhiked to the site with the mussel. Wrinkled purple (*Nucella lamellosa*), keyhole limpet (*Diodora aspera*), and sea urchin attain an edible size and were probably used as food. They were rarely found in the samples, and it is doubtful that they were used on a regular basis.

In addition to the marine shellfish, three species of land-dwelling snails were identified. Townsend's snail (*Polygyra townsendiana*), banded forest snail (*Monadenia fidelis*), and a type of Selen (*Selenites* sp.) were found in the midden. Because these snails occur naturally within the area, their use for subsistence purposes is problematical. A freshwater inhabitant of streams and springs, Nuttall's flood snail (*Flumicola nuttalliana*), was also identified. It is unlikely that it was a food source due to its small size. It was probably a hitchhiker to the site on grass or stones collected in nearby streams.

GROWTH RING ANALYSIS

An idea of the season during which shell middens were occupied can be obtained from the shellfish recovered. Analysis of the growth rings on shellfish has been shown to be a reliable means of estimating the season of occupation at archaeological sites (Ham and Irvine 1975; Ham 1976; Keen 1979). In bivalves, shell growth occurs on the ventral edge of the shell when the valves are open collecting food. A growth ring or layer is defined as two surfaces that vary in color from the previous growth layer as a result of a change in the rate of deposition of calcium carbonate. The deposition rate of calcium carbonate is influenced by physical or chemical changes in the environment (Wilbur 1964). Variation in growth rings found in marine molluscs is explained as the result of changes in food supply and water temperatures over the course of the year. A light wide ring develops during the spring and summer when shell growth is greatest, while a dark thin ring is formed in the winter when growth rates decline (Ham and Irvine 1975; Keen 1979).

Ham and Irvine (1975) discuss four techniques for studying growth rings, one of which has been used here. This technique involved sawing a valve in half lengthwise and polishing the transverse section. A solution of methylene blue was then applied to the polished section. The solution was more readily absorbed by the light-colored, less dense summer growth rings, making them stand out from the darker winter check rings. A Swift binocular microscope (7-30x) was used to help distinguish the winter check rings from the spring and summer growth. By checking the growth rings on the surface of the transverse section, using the most recent winter check ring and subsequent growth, the approximate season of death was obtained.

Forty-seven valves from littleneck clams (*Protothaca staminea*) and butter clams (*Saxidomus giganteus*) recovered in the grab samples from 35LNC50 were used in the seasonality study. This sample includes all of the whole or nearly whole valves of butter clam and littleneck clam obtained from the site. Table 5-5 lists the results and interpretations of the season of death for the selected valves. The season of death was inferred using the percentage of growth of the valve's most recent annual growth band as compared to the previous growth band. Several different interpretations of the percentages and their relationship to the season of death have been suggested (Ham and Irvine 1975; Keen 1979; Wesson 1982; Hurst 1986). Wesson (1982) interprets the percentages in this way:

0-40% - late winter to early spring
40-70% - late spring and summer
70-85% - fall
85-100% - early winter

Wesson's interpretation is used in Table 5-5 because it is somewhat more generalized and is probably more appropriate for the small sample size of the present study. As the data in Table 5-5 indicate, 75% of the valves were interpreted as having a late winter to early spring season of death; another 17% of the valves fall into the late spring to summer category. Although it should be noted that the species used for the seasonality study are all protected water species and are very minor constituents of the midden, in view of their distribution throughout the midden it seems likely that the results of this study do in fact reflect the true season of the site occupation.

Table 5-5. Seasonal interpretation from growth ring analysis, 35LNC50.

Species	Level	Unit	Growth	Inferred Season*			
				W	W/S	SS	F
Protothaca staminea	3	B	0%		X		
		C	0%		X		
		C	46%		X		
		D	16%		X		
		E	0%		X		
		F	0%		X		
		F	50%			X	
	4	C	0%		X		
		C	33%		X		
		D	14%		X		
		D	67%			X	
		E	0%		X		
		E	0%		X		
		E	15%		X		
		E	27%		X		
Saxidomus giganteus	2	B	47%			X	
		C	7%		X		
	3	P3	53%			X	
		P3	80%				X
		B	34%		X		
		C	0%		X		
		C	0%		X		
		C	0%		X		
		C	0%		X		
		C	79%				X
		D	0%		X		
		E	24%		X		
		E	34%		X		
		F	39%		X		
	4	C	0%		X		
		C	0%		X		
		C	10%		X		
		C	17%		X		
		C	19%		X		
		C	42%		X		
		C	47%		X		
		D	0%		X		
		D	0%		X		
		D	37%		X		
		D	50%			X	
		D	94%	X			
		E	0%		X		
		E	6%		X		
	5	C	0%		X		
		C	100%	X			
	6	C	0%		X		
		C	20%		X		

* Inferred Season:		
	W/S	late winter/early spring (0-40%)
	SS	late spring/summer (40-70%)
	F	fall (70-85%)
	W	early winter (85-100%)

CONCLUSIONS

Sea mussel was the dominant marine shellfish species eaten at 35LNC50, accounting for approximately 90% of the identifiable remains by weight. Although they were found consistently throughout the midden, horse barnacle, goose barnacle, and black katy chiton were less intensively exploited. Horse clam, littleneck clam, butter clam, and cockle were also present, but to a much lesser extent. Given the rocky outer coast environment near the site, the presence of mussel, piddock, chiton, and barnacles is to be expected. The less frequently encountered clam and cockle species are generally available in quantity only at protected beaches at some distance from the site.

It appears, then, that the inhabitants of 35LNC50 focused their shellfish gathering efforts primarily on the readily available outer coast molluscan species close to the site. The seasonality data strongly suggest a late winter to early spring occupation. During this time of the year, the foods stored by native peoples for winter consumption sometimes grew tiresome or became depleted. It therefore seems likely that the collecting of shellfish, especially littleneck and butter clam, at 35LNC50 was emphasized in late winter and early spring either for a change of diet or because other resources were in low supply.

CHAPTER 6

VERTEBRATE FAUNAL REMAINS

by Ruth L. Greenspan and Rebecca J. Wigen

Vertebrate faunal remains recovered from excavation units and probes during the 1988 excavations at 35LNC50 consist of 2158 specimens, all of which were included in the analysis and identified to the lowest possible taxonomic unit. All specimens were identified using osteological reference collections at the Smithsonian Institution (National Museum of Natural History), the American Museum of Natural History, and at the University of Victoria (Department of Anthropology).

Of the 2158 specimens, 329 specimens (15.2%) were not identifiable on any level; 1070 (49.6%) were identified only as large or medium-sized mammals; 103 (4.8%) represent marine mammals; 50 (2.3%) represent terrestrial mammals; 438 (20.3%) were identified as fish remains; and 163 specimens (7.6%) represent birds. An inventory of the vertebrate faunal identifications from the 1988 excavations at 35LNC50 is presented in Table 6-1.

TERRESTRIAL MAMMALS

The terrestrial mammal remains recovered at 35LNC50 are primarily those of deer and elk. Half of the 1988 vertebrate faunal assemblage consists of unidentifiable large mammal remains; undoubtedly a number of these specimens represent deer and elk as well. Other terrestrial mammals recovered include a few carnivore and rodent specimens. Deer, elk, and carnivores no longer inhabit the Yaquina Head area, having been eliminated, along with various other species, by the considerable human activity associated with the lighthouse facility (Bureau of Land Management 1983). However, the terrestrial mammals represented in the faunal assemblage are taxa that are presently distributed along nearby portions of the Oregon coast (Maser et al. 1984), and presumably these animals were available in the general site vicinity in the prehistoric past.

MARINE MAMMALS

Marine mammals recovered during the 1988 excavations at 35LNC50

Table 6-1. Inventory of faunal remains from 1988 excavations, 35LNC50.

	Level Below Surface								
Taxon	1	2	3	4	5	6	7	8	Total
TERRESTRIAL MAMMALS:									
Odocoileus hemionus	1	1	13	2	1				18
Cervus elaphus		1	3	2	3	3			12
Cervidae	2	2	2			1			7
Carnivora		2	1		1		1		5
Aplodontia rufa			1						1
Microtinae		2							2
Rodentia		1			4				5
MARINE MAMMALS:									
Phoca vitulina	4	1	4	5	7	8			29
Eumetopias jubatus	1	3		1	4	1			10
Zalophus californianus	1	1							2
Callorhinus ursinus	1	2	1	3					7
Otariidae		5	5						10
Pinnipedia	5	3	1	2	6	3	1		21
Cetacea		3	5	2	5				15
Enhydra lutris		1	3		2	1	1		8
UNIDENTIFIABLE MAMMALS	112	260	249	98	255	85	8	3	1070
FISH:									
Clupea pallasii	31	76	31	1	1	1			141
Onchorynchus sp.	2	9	1			1			13
Merluccius productus	2	5		1					8
Embiotocidae	1	14	1	1	3				20
Embiotoca lateralis	1	1	1						3
Rhacochilus vacca				1					1
Sebastes sp.				1					1
Hexagrammos sp.	3	4	1	1					9
Ophiodon elongatus		2							2
Enophrys bison	1	6	11						18
Cottidae		1							1
Pleuronectidae			1						1
Unidentified fish	28	90	59	29	17	3			226
BIRDS:									
Gaviidae			1		3				4
Fulmaris glacialis					1				1
Phalacrocorax sp.	1	1	11	21	36	3			73
Anatidae		3	3	1	12				19
Athyinae			1						1
Larus sp.			5	3	1				9
Uria aalge	1			2					3
Buteo sp.			2	1					3
Unidentified bird	2	7	21	8	6	5			49
REPTILE		1							1
UNIDENTIFIABLE	18	43	70	120	53	19	5	1	329
TOTAL	218	551	508	306	421	134	16	4	2158

include harbor seal, Steller sea lion, California sea lion, northern fur seal, whale, and sea otter. Below are brief discussions of each of these taxa with respect to their behavior and their likely occurrence in the vicinity of Yaquina Head.

Harbor Seals (*Phoca vitulina*)

Harbor seals are very common marine mammals along the Oregon coast throughout the year. They are found near shore, in bays and estuaries, and occasionally in freshwater river systems. Hauling out places include sand bars, mud flats, rocks, islands, and reefs where water is always accessible (Mate 1984:438-439). Harbor seals haul out on the rocks in or near the intertidal zone at Yaquina Head (Bureau of Land Management 1983:13).

Harbor seal pupping season varies geographically, occurring later in the year at more northerly locations. Along the Oregon coast most pups are born in April and May, but there is considerable variation, and births have been recorded as early as mid-February and as late as mid-June (Mate 1984:440).

Harbor seals are monogynous breeders. Because of the lack of dominance and territoriality associated with this breeding strategy, there is no selective advantage in larger, more aggressive males. Thus males tend to be only slightly larger than females, and the two are difficult to distinguish skeletally.

Steller Sea Lion (*Eumetopias jubatus*)

The Steller, or northern, sea lion is the largest of the sea lions. In the eastern Pacific it ranges from the Pribilof Islands on the north to San Miguel Island, California (King 1983:20). Steller sea lions occasionally haul out on the rocks below Yaquina Head (Bureau of Land Management 1983:13).

Although they are primarily a nearshore species, Steller sea lions rarely breed or haul out on the mainland, preferring rocky areas on offshore islands. In Oregon adult males arrive at breeding grounds in June and compete amongst themselves for the best territories. One male breeds with many females. The stronger, more aggressive males establish better territories that the females are attracted to, and thus enjoy greater reproductive success. This situation selects for large, aggressive males, and there is considerable sexual dimorphism with respect to size in this species (Mate 1984:450).

Males remain on the rookeries throughout the breeding season. In mid-July, at the end of the breeding season, adult males in California, Oregon, and Washington leave the breeding grounds and move north into British Columbia and Alaska. By the end of October no adult males remain along the Oregon coast, although females and pups may overwinter there (Mate 1984:449).

California Sea Lion (*Zalophus californianus*)

Along the coast of North America the California sea lion is distributed primarily in California waters, ranging from the Channel Islands south to the southern tip of Baja California, Mexico, and throughout the Gulf of California. At the end of the breeding season in mid-July some adult and subadult males move north to overwinter in British Columbia. Although there are at present no breeding grounds in Oregon, migrant males are not uncommon in Oregon waters during the fall and winter, with peak populations occurring in September and October (Mate 1984:452-453).

The size range of adult male California sea lions overlaps with that of adult female Steller sea lions, and it is difficult to distinguish between them from most postcranial skeletal elements. Both of the specimens in the 1988 assemblage identified as California sea lion are teeth.

Northern Fur Seal (*Callorhinus ursinus*)

In the eastern Pacific northern fur seals are presently distributed between two breeding areas: one in the Pribilof Islands, which is the largest northern fur seal population in the world, and a second, small population on San Miguel Island. The San Miguel population was established quite recently, in the 1960s (King 1983:61). However, there is strong evidence from archaeological sites along the northwest coast of North America to suggest that the distribution of northern fur seal breeding grounds was different in the prehistoric past than it is today, and that *C. ursinus* was probably breeding along the Oregon coast (Greenspan and Wigen 1987:59; Lyman 1988).

On the Pribilof Islands pupping and breeding season is from mid-June until late July, after which adult females and subadults of both sexes migrate south, some as far as southern California. Some adult males also migrate; others remain in northern waters throughout the year. All northern fur seals are pelagic except during breeding season, and generally they stay within 16 to 160 km offshore. They are rarely seen on shore on the Oregon coast (Mate 1984:456-457).

Sea Otter (*Enhydra lutris*)

Sea otters were at one time widely distributed on both sides of the Pacific Ocean. In the eastern Pacific, they ranged from central Baja California north along the entire coast of North America (Kenyon 1975). Overhunting resulted in their extinction in much of their former range, and they apparently were gone from the Oregon coast by 1906. In 1911 sea otters were declared a protected species and their numbers have increased since that time, although reintroductions to the Oregon and Washington coasts have had only limited success (Mate 1984:430).

Sea otters occupy waters of the open coast. Although they do enter bays, they never go far from the open sea. They dive for food on the ocean bottom in water no deeper than 54 m. Favored habitats are waters adjacent to rocky coasts in areas with extensive underwater reefs and kelp beds, such as those in the intertidal zone surrounding Yaquina Head. Sea otters do haul out on land, preferably on rocky points, but sometimes on sand beaches or spits (Kenyon 1975:57).

Sea otters do not have a fixed breeding season; they may mate throughout the year, but most mating seems to occur in June. Gestation period is from 10 to 12 months, and most births occur in spring and summer (Kenyon 1975:235-239). Although juvenile specimens were recovered from both the 1980 and 1988 excavations at 35LNC50, lack of a fixed pupping season and lack of adequate age data in available comparative collections make seasonal estimates from the presence of these immature specimens very difficult.

Whales (Cetacea)

The whale material recovered from 35LNC50 was very fragmentary, and no more specific identification was possible. Gray whales pass the tip of the headland on their annual migrations north and south (Bureau of Land Management 1983:18), and tourists have reported seeing killer whales (which are actually large dolphins) off the coast of Yaquina Head in late summer. Many other species of whales occur along the Oregon coast.

FISH

The 1988 assemblage of fish remains from 35LNC50 is dominated by specimens of Pacific herring. Herring are completely lacking from the 1980 assemblage; this is almost certainly a result of the earlier excavation having been conducted using 6.3 mm (1/4-inch) mesh screen, rather than reflecting real differences between the two assemblages. Other fish recovered in 1988 include salmon; Pacific hake; surfperches, including striped surfperch and pile surfperch; buffalo sculpin; greenlings, including lingcod as well as smaller greenlings; and a single representative each of rockfish and the righteye flounder family.

The assemblage of fish remains from 35LNC50 suggests that most fishing activity occurred in nearshore habitats. Although herring are offshore residents, they do come into shallow water to spawn. In Oregon most herring populations spawn between January and March (Morrow 1983: 17-19; Eschmeyer, Herald, and Hammann 1983:71). The annual inshore movement of herring is variable in time; they may come in just before actual spawning activity, or they may come in several months prior to that (Hart 1973:97-99). This means that the time of year when herring are likely to be found near shore along the Oregon coast ranges from late fall to spring.

Surfperches, greenlings, buffalo sculpin, and rockfish all commonly feed in intertidal rocky habitats near shore. Lingcod, while more common a bit farther out in nearshore rocky reef habitats, do invade the rocky intertidal zone, particularly during their winter spawning period. Salmon are sometimes found in nearshore rocky reef habitats, and a run of Coho salmon occurred in the past during mid-spring in Big Creek on Agate Beach just to the south of Yaquina Head. Pacific hake are more of an ocean fish, but they are caught in low frequencies in nearshore rocky reef habitats (Barker 1974; Zontek 1982:16-19).

BIRDS

Cormorants dominate the bird specimens recovered in 1988 from 35LNC50, comprising 64.3% of the identified bird remains. If the assemblages from 1988 and 1980 are combined, the proportion of cormorants is lowered somewhat to 55.3%, but is still a strong majority. Other birds represented include unidentified ducks, gulls, the common murre, loons, hawks, and a single specimen of fulmar. The 1980 assemblage also contains a specimen of grebe, one of rhinoceros auklet, and a few unidentified alcids (see Chapter 3).

Cormorants (*Phalacrocorax* sp.) are large, fish-eating aquatic birds that belong to the same order (Pelecaniformes) as pelicans. Specific identifications were not possible due, in part, to a lack of available comparative material. However, on the basis of size, it appears that there are at least three species of cormorants represented in the assemblage from 35LNC50, most likely the double-crested cormorant (*P. auritus*), Brant's cormorant (*P. penicicillatus*), and the pelagic cormorant (*P. pelagicus*). All three of these birds are common users of the Yaquina Head area throughout much of the year, and Brant's cormorant and the pelagic cormorant both breed there (Bureau of Land Management 1983:14).

Other birds represented at 35LNC50 that use the Yaquina Head area throughout much of the year include gulls, the common murre, and some ducks. Gulls are aquatic birds that are primarily scavengers. They are very common along the Oregon coast, and at least seven species are known to utilize the Yaquina Head area. Two of those species nest there (Bureau of Land Management 1983:14). The common murre (*Uria aalge*) breeds at Yaquina Head and is also a common year-round resident of the area.

The loons (*Gavia* sp.) are powerful diving birds that come ashore only to breed and nest. There are three species present in Oregon, and they are all winter residents in the Yaquina Head area. The common loon (*G. immer*) has been recorded in Lincoln County during every month of the year, but the arctic loon (*G. arctica*) and the red-throated loon (*G. stellata*) are primarily winter residents, and are both uncommon at Yaquina Head (Gabrielson and Jewett 1970:64-69; Bureau of Land Management 1983:14). Unfortunately, the loon specimens recovered from 35LNC50 were not identifiable to species.

Other birds recovered from 35LNC50 that are present in the Yaquina Head area only part of the year include the rhinoceros auklet (*Cerorhinca monocerata*), fulmar (*Fulmaris glacialis*), and grebes (Podicipedidae). Although the one grebe specimen recovered from the 1980 excavations was not identifiable to species, all of the three grebes that are present in the area today are primarily winter visitors to the headland. The rhinoceros auklet breeds at the headland, and is less commonly present in fall and winter as well, while the fulmar is a winter and fall visitor to the Yaquina Head area (Gabrielson and Jewett 1970; Bureau of Land Management 1983).

OTHER TAXA

A single unidentified reptile vertebral fragment was recovered in 1988.

SEASONALITY

The vertebrate faunal assemblage from 35LNC50 is not strongly seasonal in content. Cormorants, which comprise more than half of the bird assemblage, are common on the headland throughout the year. However, the presence (albeit in small quantities) of grebe, fulmar, and loons does suggest occupation during the winter or fall. Common murres nest at the tip of the headland from April to July. The presence of rhinoceros auklet suggests occupation in the spring, or perhaps the winter or fall, while the presence of herring suggests winter or spring occupation.

Of the terrestrial mammals, elk are the best seasonal indicator. Although present along the Oregon coast throughout the year, they tend to be found at low elevations more commonly in winter and fall. Of the marine mammals, two of the Steller sea lion specimens were identified as being adult males; these suggest occupation during the summer or early fall, before the adult males abandon the rookeries and move north. Juvenile seals and sea lions were also recovered from the 1980 excavations; these remains also suggest summer or fall occupation.

CONCLUSIONS

The vertebrate faunal remains recovered during the 1988 excavations at 35LNC50 indicate broad exploitation of the rich and varied resources available in the site vicinity, including both marine and terrestrial species. The seasonal indicators included in the 35LNC50 vertebrate faunal assemblages are neither strong nor numerous. However, when coupled with the molluscan seasonal data, the vertebrate fauna do suggest a late winter-early spring occupation, with the possibility of summer and fall occupation as well.

CHAPTER 7

PREHISTORIC USE OF THE NORTH YAQUINA HEAD SHELL MIDDENS

Archaeological investigations in 1988 involved limited excavations at 35LNC50 within the immediate area to be affected by construction of a fence between the public/private property boundary. It has been possible, however, to supplement the results of the present project through identification and analysis of the artifacts and faunal materials recovered during the 1980 Oregon State University test excavations at 35LNC49 and 35LNC50. While intersite comparisons are hampered somewhat by the fact that different recovery methods were employed during the 1980 and 1988 fieldwork, the results of these two projects considered together provide a fairly detailed picture of prehistoric use of the two shell middens.

CULTURAL COMPONENTS

Archaeological investigations at prehistoric shell middens traditionally focus on the information that can be obtained through analysis of the contents of the shell-bearing deposits. It is often assumed that once the midden deposits run out, the boundaries of the prehistoric occupation have been reached. While this situation may be true in many instances, it is becoming increasingly clear that at some sites evidence of occupation occurs outside the midden deposits. The best example of this situation documented to date is at 35LNC62 on the tip of Yaquina Head, where non-shell-bearing cultural deposits were found to exist above and below as well as on the inland side of the shell midden. Radiocarbon dating indicates that these deposits contain evidence of occupation before, during, and after the deposition of the shell midden at this site (Minor, Toepel, and Greenspan 1987).

A similar non-shell-bearing cultural deposit underlies the shell midden at 35LNC50. This occupation is represented by the cultural materials found in Stratum 4. These materials include two chert interior flakes and a small collection of vertebrate faunal remains including one element from a carnivore, one from a sea otter, one from an unidentified pinniped, 10 from unidentified mammals, and six other unidentifiable bone fragments. Delineation of a separate occupation underlying the shell midden is also supported by the results of the chemical analysis conducted on the sediments at this site. As noted in Chapter 2, Stratum 4 is unlike the other cultural strata in every chemical characteristic except phosphorous, reflecting some type of cultural influence on the soil distinctly different from that observed in the overlying shell midden.

The age of this initial occupation at 35LNC50 is indicated by a radiocarbon date of 1390 ± 80 BP. This date was obtained from a composite sample of charcoal recovered from the 70-80 cm levels below surface in Units D and E. Comparison with the radiocarbon dates obtained from the overlying shell-bearing strata using Student's t-test indicates that this date of 1390 ± 80 BP is statistically different from the other dates at the .05 level (t = ± 1.96). Considered altogether, then, the evidence described above reflects the existence of a separate occupation--one that did not involve exploitation of shellfish--underlying the shell midden, indicating that prehistoric peoples made some use of 35LNC50 before the first deposition of shellfish took place.

The earliest direct evidence of shellfish exploitation at 35LNC50 is represented by Stratum 3. Two statistically synchronous dates of 1150 ± 50 BP and 1160 ± 80 BP were obtained from this stratum. Continuing exploitation of shellfish is indicated by the radiocarbon dates of 940 ± 50 BP, 830 ± 60 BP, and 600 ± 50 BP from Stratum 2, the densest of the shell-bearing deposits. The latest date from 35LNC50 is 550 ± 60 BP from just below the ground surface in Stratum 1. This stratum contains a declining shell content, and prehistoric use of 35LNC50 was discontinued sometime after this date.

As noted previously in Chapter 3, no radiocarbon dates are available from 35LNC49. The single temporally-diagnostic artifact from this site, a projectile point of the size generally considered to have functioned as an arrowhead (see Figure 3-2a), could easily date within the time frame bracketed by the radiocarbon dates from 35LNC50. Until radiocarbon dates become available, it is tentatively assumed that occupation at 35LNC49 was roughly contemporaneous with that at nearby 35LNC50.

USE OF MOLLUSCAN RESOURCES

The prehistoric inhabitants of the North Yaquina Head shell middens primarily exploited sea mussels, which is understandable in view of the abundance of this mussel in the nearby intertidal zone. Midden analysis carried out on samples from 35LNC50 indicates that horse barnacle was the second most common species at that site, and was probably eaten on a regular basis but not nearly to the extent of sea mussels. The only other species constituting more than 1% of the column samples (by weight) at 35LNC50 is littleneck clam. This species of clam was common enough to have also been eaten on a regular basis. As discussed in Chapter 5, a variety of other molluscan remains were recovered from the shell midden at 35LNC50, but their low frequencies indicate that they were not eaten to any great extent. Unfortunately, detailed information on the species composition of the midden at 35LNC49 is not available, since no column samples were taken for analysis and no documentation was made in the field regarding the range of

Table 7-1. Summary of the vertebrate faunal remains from 35LNC49 and 35LNC50.

		35LNC49	35LNC50		
Taxon	Common Name	1980*	1980*	1988**	Totals
TERRESTRIAL MAMMALS:					
Odocoileus hemionus	Mule deer	10	5	18	33
Cervus elaphus	Elk	8	4	12	24
Cervidae	Deer or elk	5		7	12
Carnivora	Carnivores	1		5	6
Aplodontia rufa	Mountain beaver			1	1
Microtinae	Voles			2	2
Rodentia	Rodents		1	5	6
MARINE MAMMALS:					
Phoca vitulina	Harbor seal	15	62	29	106
Eumetopias jubatus	Steller sea lion	6	4	10	20
Zalophus californianus	California sea lion			2	2
Callorhinus ursinus	Northern fur seal		1	7	8
Otariidae	Eared seals	1	16	10	27
Pinnipedia	True and eared seals	11	13	21	45
Cetacea	Whales		1	15	16
Enhydra lutris	Sea otter	2	10	8	20
Delphinidae	Dolphins	2			2
UNIDENTIFIABLE MAMMALS:		180	559	1070	1809
FISH:					
Clupea pallasii	Pacific herring			141	141
Onchorynchus sp.	Salmon	8		13	21
Merluccius productus	Pacific hake	12	2	8	22
Embiotocidae	Surfperches	1	2	20	23
Embiotoca lateralis	Striped surfperches			3	3
Rhacochilus vacca	Pileperch			1	1
Sebastes sp.	Rockfishes		2	1	3
Hexagrammos sp.	Greenlings		1	9	10
Ophiodon elongatus	Lingcod	1	1	2	4
Enophrys bison	Buffalo sculpin			18	18
Cottidae	Sculpins			1	1
Pleuronectidae	Righteye flounders			1	1
Unidentified fish		4	23	226	253

Table 7-1 (continued)

		35LNC49	35LNC50		
Taxon	Common Name	1980*	1980*	1988**	Totals
BIRDS:					
Gaviidae	Loons			4	4
Podicipedidae	Grebes		1		1
Fulmaris glacialis	Fulmar			1	1
Phalacrocorax sp.	Cormorants	3	3	73	79
Anatidae	Ducks	1	3	19	23
Athyinae	Bay and sea ducks			1	1
Larus sp.	Gulls			9	9
Uria aalge	Common murre		13	3	16
Cerorhinca monocerata	Rhinoceros auklet		1		1
Alcidae	Auks and relatives	1	2		3
Buteo sp.	Hawk			3	3
Small bird	Robin-sized		1		1
Unidentified bird			13	49	62
REPTILE				1	1
UNIDENTIFIABLE BONE FRAGMENTS		35	692	329	1055
TOTALS		307	1436	2158	3901

* recovered from 6.3 mm (1/4-inch) mesh screen
** recovered from 3.35 mm (1/8-inch) mesh screen

species at this site during Oregon State University's 1980 test excavations.

USE OF VERTEBRATE FAUNAL RESOURCES

Analysis of vertebrate faunal remains from the North Yaquina Head shell middens indicates a somewhat broader range of resource exploitation. In a report of earlier investigations at Yaquina Head, Minor and Greenspan (1987) undertook a comparison of sites 35LNC49 and 35LNC50 based on the results of the 1980 Oregon State University test excavations. Briefly, this analysis indicated that with respect to their vertebrate faunal assemblages, these two sites were statistically different from one another. However, that analysis has been largely invalidated as a result of subsequent excavations at 35LNC50.

A complete inventory of the vertebrate faunal remains recovered from 35LNC49 and 35LNC50 is presented in Table 7-1. It is readily apparent that both the rank order and the percentages of the major taxonomic categories are very different when the more recent work is taken into account. No doubt a significant amount of this change may be attributed to the different recovery methods employed. During the 1980 test excavations the fill was passed through 6.3 mm (1/4-inch) mesh screen, while during the 1988 excavations the fill was passed through 3.35 mm (1/8-inch) mesh. This may be particularly important in accounting for the dramatic increase in the proportion of fish remains in the 1988 assemblage. In addition, when the 1988 excavations are taken into account, 35LNC50 yielded nearly 10 times as many vertebrate faunal specimens as did the 1980 excavations at 35LNC49. This difference in sample size may account for some of the observed differences between the assemblages as well.

Because of the differences in recovery methods and sample size, no statistical analysis comparing the assemblages from 35LNC49 and 35LNC50

Table 7-2. Rank order of vertebrate faunal classes at 35LNC49 and 35LNC50.

	35LNC49	35LNC50
RANK 1	UNIDENTIFIABLE MAMMALS 180 66.2%	UNIDENTIFIABLE MAMMALS 1629 63.3%
RANK 2	MARINE MAMMALS 37 13.6%	FISH 475 18.5%
RANK 3	FISH 26 9.6%	MARINE MAMMALS 209 8.1%
RANK 4	TERRESTRIAL MAMMALS 24 8.8%	BIRDS 200 7.8%
RANK 5	BIRDS 5 1.8%	TERRESTRIAL MAMMALS 60 2.3%

is attempted here. Table 7-2 shows the number, percentage, and rank ordering of the major taxonomic groupings from the two sites (excluding the completely unidentifiable remains). At both sites unidentifiable mammals make up the bulk of the remains (66.2% at 35LNC49 and 63.3% at 35LNC50). At 35LNC49 marine mammals (13.6%), fish (9.6%), and terrestrial mammals (8.8%) are represented in approximately equal proportions, while birds comprise less than 2% of the identified assemblage. In contrast, at 35LNC50 (with the samples from 1980 and 1988 combined) fish represent 18.5% of the assemblage, marine mammals comprise 8.1%, birds contribute 7.8%, and terrestrial mammals comprise only 2.3% of the vertebrate fauna.

SEASONALITY OF OCCUPATION

In addition to the detailed information about diet, the faunal remains contribute toward estimating the season(s) during which occupation at 35LNC49 and 35LNC50 took place. The results of the growth ring analysis on the littleneck and butter clams is particularly diagnostic in this respect. In addition to the 47 specimens analyzed from 35LNC50 (see Chapter 5), another 15 specimens recovered from the portion of the shell midden at 35LNC49 exposed in the eroding cliff face were also subjected to growth ring analysis by Debra C. Barner. The results of this analysis on the samples from the two shell middens is summarized in Table 7-3.

Both sites exhibit a similar pattern in that 87% of the clams from 35LNC49 and 75% of the clams from 35LNC50 were collected from late winter to early spring. Another 17% of the clams from 35LNC50 were collected from late spring to summer. It is interesting to note that at both sites the littleneck clams (*Protothaca staminea*) conform most closely to this tendency, with the butter clams (*Saxidomus giganteus*) more prone to deviate from this seasonality pattern. It is not clear whether butter clams are less reliable in this type of analysis, or if butter clams were in fact collected at different times of the year as suggested by the growth ring data.

In comparison, the vertebrate faunal assemblage is not nearly as definitive in terms of seasonality (Table 7-4). As discussed in Chapter 6, certain birds represented in low frequencies (grebe, fulmar, and loons) suggest occupation during the winter or fall, while others (common murres and rhinoceros auklet) suggest spring occupation. The presence of herring bones also suggests winter or spring occupation. In contrast, the presence of elk and certain of the sea mammals (the adult male Steller sea lions and juvenile seals and sea lions) suggest summer or fall use.

In view of the relatively small number of vertebrate faunal remains that contain seasonal information, it seems reasonable to place greater weight on the results of the growth ring analysis in interpret-

Table 7-3. Summary of growth ring analysis on shellfish from 35LNC49 and 35LNC50.

Species	Frequency	Growth	Inferred Season*
35LNC49:			
Saxidomus giganteus	1	0 - 40%	late winter to early spring
	1	85 - 100%	early winter
Protothaca staminea	13	0 - 40%	late winter to early spring
35LNC50:			
Saxidomus giganteus	23	0 - 40%	late winter to early spring
	5	40 - 70%	late spring and summer
	2	70 - 85%	fall
	2	85 - 100%	early winter
Protothaca staminea	12	0 - 40%	late winter to early spring
	3	40 -70%	late spring and summer

* from Wesson 1982

ing the season of occupation at 35LNC49 and 35LNC50. While not ruling out the possibility of shorter visits at other times of the year, given the data from the growth ring analysis on clams, these shell middens appear to have been primarily occupied during late winter to early summer.

ARTIFACT ASSEMBLAGES

The artifact assemblages from 35LNC49 and 35LNC50 share a common characteristic in that they contain relatively few formed artifacts. Of the cultural materials recovered, only the debitage was found in sufficient frequency to permit description in terms of quantitative patterns. Since only seven flakes were found at 35LNC50 during the 1980 test excavations, and because the 1980 fieldwork involved recovery by means of 6.3 mm (1/4-inch) mesh, the 1980 collections from 35LNC49 and 35LNC50 are considered separately from the 1988 collection from 35LNC50 recovered by means of 3.35 mm (1/8-inch) mesh. Since so few basalt and obsidian flakes are present in the collections, the following brief discussion focuses on the chert debitage.

Table 7-4. Seasonal availability of indicator species identified among the fauna at the North Yaquina Head shell middens.

Taxon	WINTER	SPRING	SUMMER	FALL
MOLLUSCS				
Littleneck clams	———	——— - -	- -	
Butter clams	- - - ———	——— - -	- -	- - -
BIRDS				
Grebe	———————	- - - - -		- - - - -
Fulmar	———————			- - - - -
Loon	———————			
Rhinoceros auklet	- - - - -	———————		- - - - -
Murres		———————	- - -	
FISH				
Herring	———————	- - -		
MARINE MAMMALS				
Steller sea lion (adult male)			———————	- - - -
Juvenile seals and sea lions			———————	- - - -
TERRESTRIAL MAMMALS				
Elk	———————	- - - - -	- - - - -	———————

Classification of the chert debitage according to the classes proposed by Sullivan and Rozen (1985) indicates only slight differences between the 1980 and 1988 collections (Table 7-5). Whereas complete chert flakes make up 63.4% of the 1980 collection, this class, while still the largest, dropped to only 46% in the 1988 collection. The proportion of chert debris stayed the same in the two collections, but chert broken flakes and flake fragments are much more well represented in the 1988 collection. Comparison of the proportions of cortex/non-cortex flakes in the 1980 and 1988 collections also reveals only slight differences, with chert cortex flakes more frequent and chert non-cortex flakes correspondingly less frequent in the 1988 collection (Table 7-6). Classification of the chert debitage into size classes indicates that the major differences are in the higher proportion of larger size flakes in the 1988 collection as compared to the 1980

Table 7-5. Summary of lithic debitage by raw material and debitage class.

Raw Material	Debitage Class	1980 Testing		1988 Excavations	
		35LNC49 & 35LNC50		35LNC50	
Chert:	Complete	52	63.4%	83	46%
	Broken	3	3.7%	11	6%
	Fragment	12	14.6%	53	30%
	Debris	15	18.3%	33	18%
Basalt:	Complete	2	40%	5	83%
	Debris	3	60%	1	17%
Obsidian:	Complete			1	100%

collection (Table 7-7). This situation is noteworthy, as it would have been expected that use of the smaller 3.35 mm mesh during the 1988 fieldwork would have resulted in the recovery of a higher frequency of very small flakes.

According to Sullivan and Rozen (1985), core reduction results in relatively high proportions of complete flakes, debris, and a large percentage of cortex flakes (60-100%), while shaped stone tool manufacture produces comparatively high proportions of flake fragments and broken flakes, with low percentages of cortex flakes (0-20%). The picture that emerges from the classification of the debitage from the

Table 7-6 . Summary of presence/absence of cortex on lithic debitage.

Raw Material	Debitage Class	1980 Testing		1988 Excavations	
		35LNC49 & 35LNC50		35LNC50	
Chert:	Cortex	22	27%	58	32%
	Non-cortex	60	73%	122	68%
Basalt:	Cortex	4	80%	2	33%
	Non-cortex	1	20%	4	67%
Obsidian:	Non-cortex			1	100%

Table 7-7 . Summary of lithic debitage by raw material and size classes.

Material/	Flake Size (mm)	1980 Testing		1988 Excavations	
		35LNC49 & 35LNC50		35LNC50	
Chert:	<10	30	36%	9	5%
	10-20	17	21%	51	28%
	20-30	19	23%	49	27%
	30-40	7	9%	37	21%
	40-50	7	9%	18	10%
	>50	2	2%	16	9%
Basalt:	10-20	1	20%		
	20-30			1	17%
	30-40			1	17%
	40-50	2	40%	1	17%
	>50	2	40%	3	49%
Obsidian:	10-20			1	100%

North Yaquina Head shell middens, then, is that both core reduction andshaped stone tool manufacture were conducted at these sites. The high proportion of complete flakes is consistent with the fact that cobbles of chert, presumably obtained from nearby beach gravels, were being broken up during the core reduction process. The high proportion of flake fragments indicates that efforts were also made to shape the materials resulting from the core reduction process into finished tools. Since few finished tools were recovered from these sites, they presumably were carried back to villages or to other sites in the prehistoric settlement-subsistence system.

SETTLEMENT ROLE

As a means of assessing the role of the North Yaquina Head shell middens in the prehistoric settlement system, 35LNC49 and 35LNC50 can be briefly compared to 35LNC62 at the tip of Yaquina Head. The latter site contains at least one semisubterranean pithouse and other evidence indicating it was a prehistoric village (Minor, Toepel, and Greenspan 1987). As is the case at 35LNC49 and 35LNC50, sea mussels are the primary midden constituent at 35LNC62. Other aspects of the archaeological record at these sites differ, however.

For example, tools and lithic debitage occur in much higher frequencies at 35LNC62 than at 35LNC49 and 35LNC50 (Table 7-8). While this impression is no doubt a reflection in part of the greater extent of the excavations at 35LNC62, the data nevertheless suggest that tool use and manufacture were much more important at 35LNC62 than at 35LNC49 and 35LNC50. This situation is consistent with the nature of the tools found at the latter sites, as most of the items recovered appear to represent "expedient" tools that were used and then discarded. This artifact pattern is, of course, characteristic of settlements occupied on a short-term basis while various hunting, collecting, and fishing activities were carried out.

Particularly noteworthy is the difference in the frequency of basalt debitage at the various sites. At 35LNC49 and 35LNC50 only 11 basalt flakes were recovered, constituting only 4% of the total debitage. In contrast at 35LNC62, 1722 basalt flakes representing 52% of the total debitage were collected. The greater frequency of basalt debitage at 35LNC62 is no doubt due to the presence of basalt cobbles on the beach below the site, a situation that does not occur at 35LNC49 and 35LNC50.

Differences between 35LNC49 and 35LNC50 and 35LNC62 at the tip of Yaquina Head and are even more distinguishable when the vertebrate faunal remains analyzed by Ruth L. Greenspan and Rebecca J. Wigen are considered. The assemblage from 35LNC62 includes at least 21 species of birds, 14 species of fish, six species of marine mammals, and eight species of terrestrial mammals. This compares with nine species of birds, nine species of fish, six species of marine mammals, and five species of terrestrial mammals represented at 35LNC50. Again, this difference may reflect in part the larger size of the excavations at 35LNC62, but the scale of the difference is such as to suggest that use of 35LNC50 by prehistoric peoples was really more restricted in nature.

In order to test for general differences in the faunal assemblages from the two sites, a chi square contingency table was constructed

Table 7-8. Comparison of artifact assemblages.

Tool Series	35LNC49	35LNC50	35LNC62
Flake Tools	5	5	41
Cobble Tools	4		21
Cores	5	1	15
Debitage	83	194	3317
Bone/Antler Tools	1	6	25
Shell Artifacts		3	2

comparing gross taxonomic categories: marine mammals, terrestrial mammals, fish, and birds. The results indicate that the two assemblages are statistically different from one another at the .01 level of significance. The 1980 assemblage from 35LNC50 was not included in this analysis because it was excavated using a 6.3 mm (1/4-inch) mesh screen, and the 1988 assemblage and that from 35LNC62 were excavated using 3.35 mm (1/8-inch) mesh screen. This difference in recovery methods could have a significant effect on the numbers of small remains recovered.

It is likely that the differences in the faunal assemblages from 35LNC50 and 35LNC62 reflect different seasonal and functional use of these sites. Analysis of the molluscan and vertebrate fauna from 35LNC62 suggested occupation during all seasons of the year, as would tend to be consistent with its use as a prehistoric village. In contrast, the seasonal indicators from 35LNC49 and 35LNC50, while admittedly less robust, suggest more limited use these sites, with the primary season of occupation being winter and early spring.

ENVIRONMENTAL DYNAMICS

In addition to the contributions their study makes to reconstructing the lifeways of prehistoric cultures, archaeological investigations sometimes produce information about past environmental conditions in the vicinity of the excavated sites. Recent archaeological research at two sites, Tahkenitch Landing (35DO130) and Yaquina Head (35LNC62), have documented changes in local prehistoric environments along the central Oregon coast (Minor and Toepel 1986; Minor, Toepel, and Greenspan 1987). These changes appear to relate in one way or another to a relative rise in sea level within approximately the last 3000 years. That relative sea level continued to rise into very late prehistoric times is clearly demonstrated by the presence of archaeological sites with waterlogged components along the Oregon coast. The closest of these "wet sites" to Yaquina Head are to the north at 35TI1 on Netarts Bay (Newman 1959:57-58, 63-64) and 35TI4 on Nehalem Bay (Woodward 1986).

Recent geological studies suggest that tectonic activity along the Cascadia Subduction Zone may very well have been a factor in contributing to relative sea level change along the Oregon and southern Washington coast (Heaton and Hartzell 1987). Evidence has been found of buried wetlands along the lower course of coastal rivers that appear to have been created as a result of abrupt coastal subsidence of the kind often associated with sizable earthquakes (Atwater 1987).

The area nearest Yaquina Head where coastal subsidence studies have been conducted and reported is Netarts Bay, where six buried marsh surfaces have been radiocarbon dated at 3300 ± 100, 2220 ± 90 BP, 1840 ± 60 BP, 1670 ± 80 BP, 1270 ± 60 BP, and 370 ± 60 BP (Peterson,

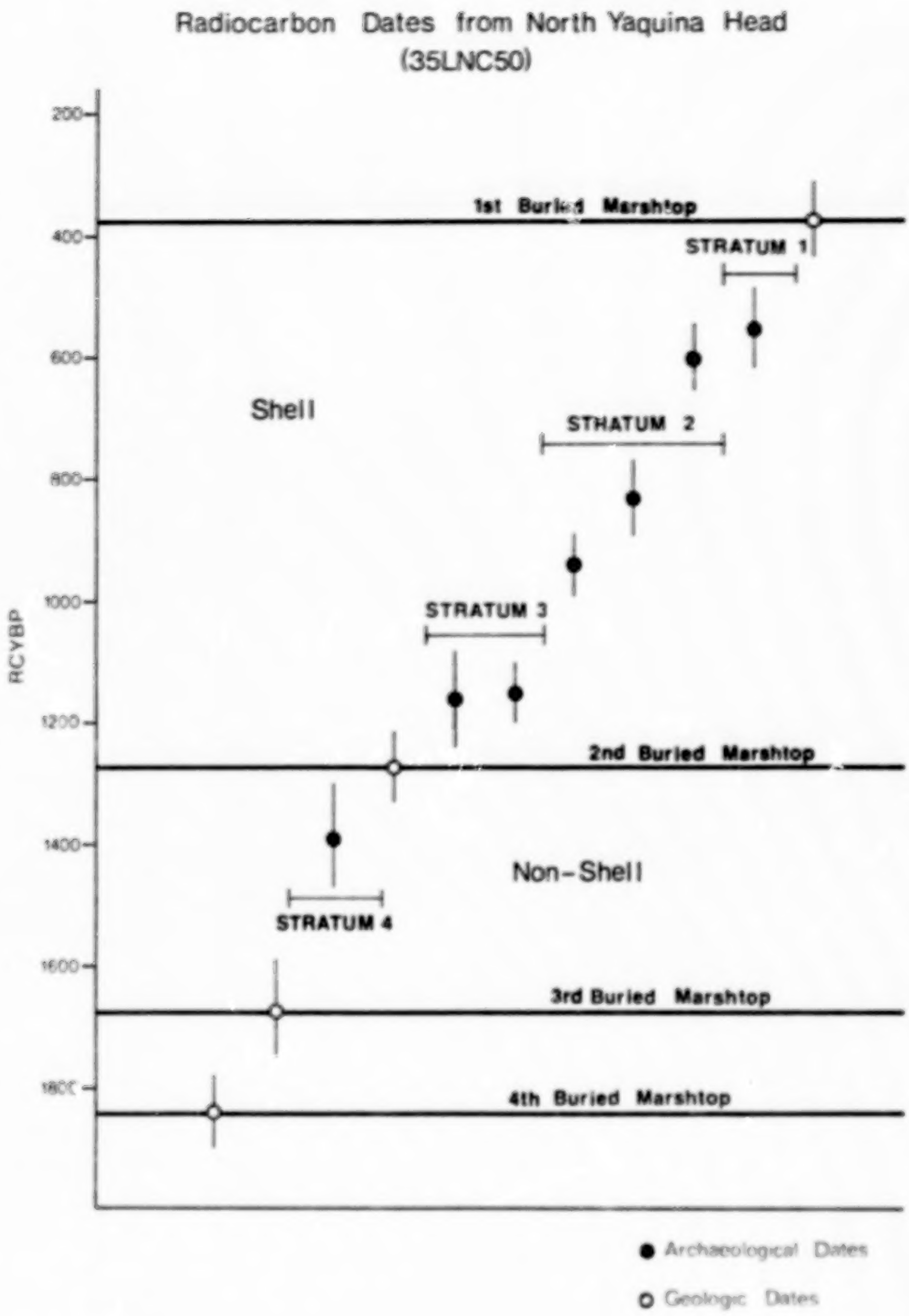

Figure 7-1. Distribution of radiocarbon dates from 35LNC50 in relation to hypothesized coseismic subsidence events at Netarts Bay (from Minor 1989).

Darienzo and Parker 1988). A plot of the radiocarbon dates from 35LNC50 shows that all six dates from the shell-bearing strata fall between the dates for the first (uppermost) and second buried marsh surfaces (Figure 7-1). The seventh and oldest radiocarbon date from 35LNC50, which was associated with the pre-shell midden occupation, predates these last two subsidence events.

The temporal distribution of the six radiocarbon dates from the shell-bearing strata thus seems to indicate that deposition of the shell midden at 35LNC50 correlated with a period of relative stability in between these last two subsidence events. Occupation was discontinued sometime after 550 ± 60 BP, a date that is sufficiently close to the age of the first subsidence event at 370 ± 60 BP to suggest that the site may have been abandoned as a result of a change in the local coastal environment resulting from an earthquake.

Evidence of such environmental change may be represented by the relatively frequent occurrence of butter and littleneck clams at 35LNC49 and 35LNC50. As noted in Chapter 4, these species prefer the calm water of bays and estuaries, but they can also be found in protected settings along the outer coast. Their relative frequency in the middens strongly suggests that during the period these sites were occupied these molluscan species were available locally, most likely below the sites in the small cove formed by the westward extension of Yaquina Head. As a result of subsidence associated with the most recent earthquake, relative sea level may have risen and changed the molluscan habitats below the sites, accounting for the fact that these species of clams are only rarely found along the shores of Yaquina Head at the present time. The situation at 35LNC50 thus suggests that archaeological evidence from shell middens may have an important role to play in documenting the occurrence and significance of prehistoric earthquakes along the Oregon coast (Minor 1989).

CHAPTER 8

SUMMARY AND CONCLUSIONS

Although shell middens are a highly visible aspect of the archaeological record left behind by prehistoric peoples, relatively few of these sites along the Oregon coast have been subjected to detailed study. The proposed property boundary fence construction by the Bureau of Land Management provided a rare opportunity to conduct archaeological investigations at one of these sites. By combining the the results of the 1988 investigations at 35LNC50 with data obtained from the earlier 1980 Oregon State University test excavations at this site and nearby 35LNC49, it has been possible to obtain a reasonably detailed reconstruction of the activities carried out by prehistoric peoples at these localities. Studies such as this one are especially important because many shell middens have been destroyed as a result of development along the Oregon coast. Archaeological investigations at the North Yaquina Head shell middens were timely, as 35LNC49 and the portion of 35LNC50 on private property are now situated beneath a housing subdivision.

The 1988 investigations at 35LNC50 determined that two cultural components are represented at that site. The age of the earlier component, represented by cultural materials recovered in Stratum 4 underlying the shell midden, has been dated by a single radiocarbon determination of 1390 BP. Cultural remains from this component were limited, but include a small number of animal bones indicating that hunting of mammals, including a sea otter and an unidentified pinniped, were conducted during this occupation. The evidence of sea mammal hunting contained in this non-shell-bearing cultural stratum is significant, as it has been assumed by some archaeologists that coastal sites in which shell is absent are (1) older than shell middens, and (2) representative of terrestrial rather than coastal adaptations (e.g., Ross 1984). Documentation of contemporary shell and non-shell cultural components during archaeological investigations in 1986 at 35LNC62 on the tip of Yaquina Head effectively proved these assumptions to be false (Minor, Toepel, and Greenspan 1987:146-149). Definition of the early component at 35LNC50 thus provides further evidence that non-shell bearing coastal sites were occupied contemporaneously with shell middens and that they were a part of the system of settlements occupied by prehistoric peoples adapted to the natural resources found in the coastal environment.

Radiocarbon dates indicate that occupation at 35LNC50 occurred within a span of less than 900 years between about 1390 BP and 550 BP. While no radiocarbon dates are available from 35LNC49, the single temporally-diagnostic artifact recovered from the site (a small projectile point) could easily fit within the same timespan. The period during which these sites were occupied is well within the estimated span of occupation by Penutian-speaking peoples on the Oregon coast, and it is likely that the inhabitants of these shell middens were direct ancestors of the Yaquina Indians occupying this section of the Pacific coast at the time of historic contact.

The Yaquina and other native peoples inhabiting the Oregon coast at the time of historic contact are known to have resided in permanent villages during the winter, with a range of less permanent settlements visited during the remainder of the year. Considering the nature of the cultural remains found in the shell-bearing components at these sites, 35LNC49 and 35LNC50 appear to represent two of these seasonally-occupied campsites. The results of the faunal analyses indicate that shellfish gathering and the hunting of a variety of fauna were carried out at these sites. Sea mussels comprise over 90% of the shell middens (by weight). Terrestrial mammal remains recovered are primarily those of deer and elk, while the marine mammal remains are primarily from harbor seal, with Steller sea lion, California sea lion, northern fur seal, whale, and sea otter also represented. The substantial number of fish remains recovered consist predominantly of Pacific herring bones, with salmon, Pacific hake, Buffalo sculpin, surfperches and other fishes less common. Bird remains are mostly from cormorants, with ducks, common murres, and other birds also represented.

Growth ring analysis of clams recovered from the middens indicates that use of 35LNC49 and 35LNC50 by prehistoric peoples occurred primarily from late winter to spring. Seasonal indicators present among the vertebrate faunal remains are less definitive, and suggest the possibility that these sites may have been visited at other times of the year as well. In view of the relatively small areal extent and depth of these shell middens, use of these sites probably involved task-specific groups, rather than entire village populations. These small groups presumably ranged out from permanent villages in late winter and spring in search of resources to either replenish depleted winter stores or to provide some much-needed variety to the diet of stored foods relied upon during the winter months.

The six radiocarbon dates obtained from the shell-bearing strata at 35LNC50 all fall neatly into the span between two episodes of coastal subsidence that are thought by scientists to have been associated with prehistoric earthquakes. With this in mind, it seems reasonable to speculate that the inception of occupation and the later abandonment of 35LNC50 were somehow related to the creation and subsequent destruction of the molluscan beds in the cove below the site. Some evidence in support of this idea is found in the occurrence of butter and littleneck clams in the North Yaquina Head shell middens, as these species are only rarely found at Yaquina Head today. Although much more work needs to be done to fully evaluate the implications for archaeological research, the results of the investigations at 35LNC50 do seem to tentatively support the idea that earthquakes and coseismic subsidence did in fact occur along the Oregon coast in prehistoric times.

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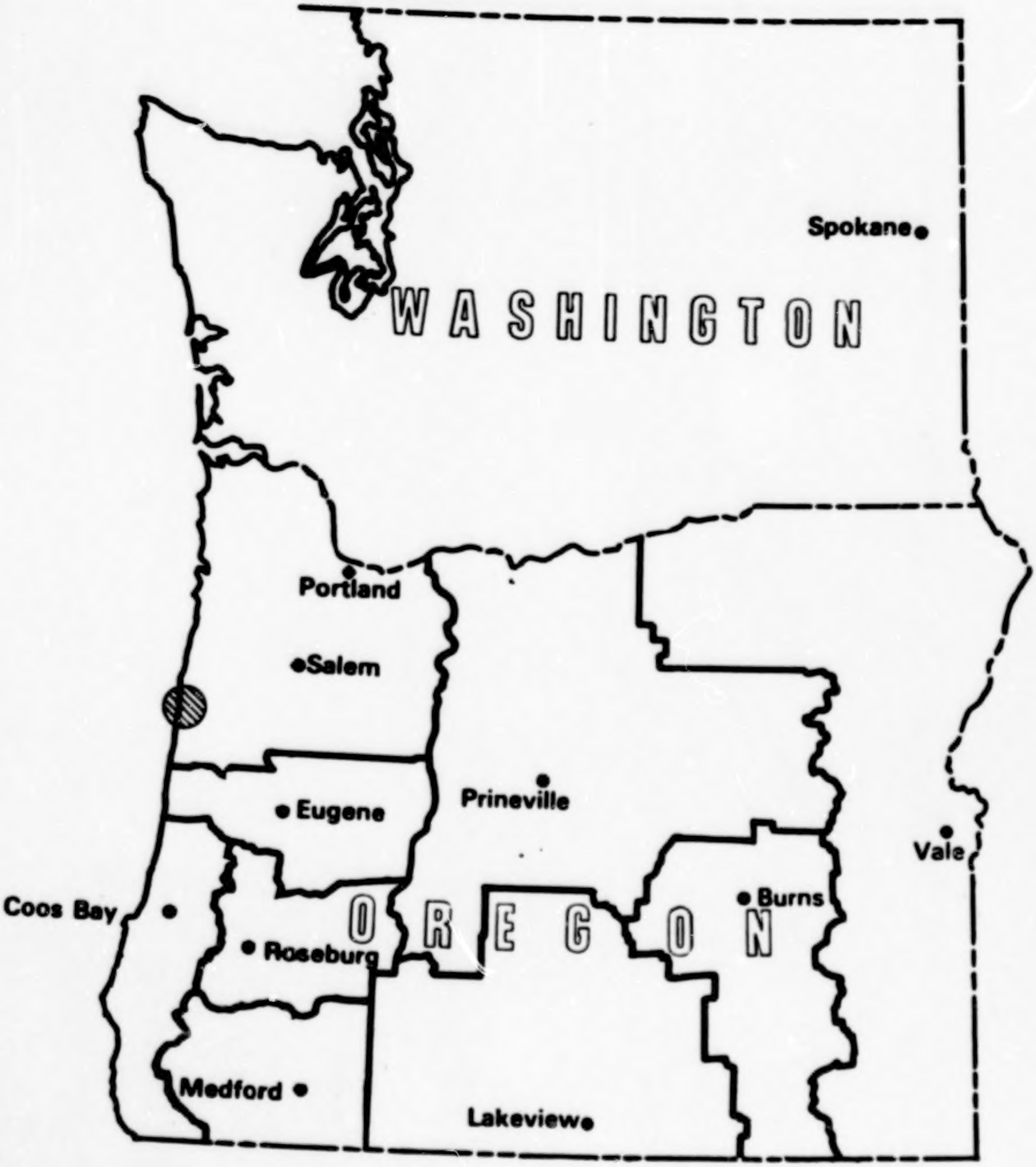
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